PROCEEDINGS OF A WORKSHOP ON LOGGING/CARIBOU RELATIONSHIPS WITH SPECIFIC REFERENCE TO THE NORTH THOMPSON AND RAFT P.S.Y.U.s

Province of British Columbia

Environment and
Land Use Committee
Secretariat

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PROCEEDINGS OF A WORKSHOP ON LOGGING/CARIBOU RELATIONSHIPS WITH SPECIFIC REFERENCE TO THE NORTH THOMPSON AND RAFT P.S.Y.U.s

Held at the Hospitality Inn, Kamloops

May 15 & 16, 1979

Proceedings Compiled by John Dick, ELUC Secretariat

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NOTE FROM THE COMPILOR

The question and comment sections following each presentation have been developed from notes taken during the workshop. Any errors, omissions, or misinterpretations are entirely my responsibility and will be corrected in an addendum which will be prepared after a full review of the proceedings by all participants.

John Dick
ELUC Secretariat
May 24, 1979.

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TUESDAY, MAY 15, 1979

1. Introductory Remarks - Peter Walton, ELUC Secretariat, Victoria, Workshop Chairperson

- welcome to the Kamloops Workshop on Logging/Caribou Relationships with specific reference to the North Thompson and Raft P.S.Y.U.'s
- new location for Workshop was made necessary as the number of persons interested in attending climbed from the thirty originally anticipated to fifty
- I suggest that we go around the table and introduce ourselves and also that you sign your name, agency/company and address on the list circulating
- if the group is in agreement, I would also suggest that there be no smoking within the meeting room

- I see the Workshop as having two principal objectives:

  i. to ensure that a common basis of information is shared by the principal agency participants
  ii. to bring the conflict closer to resolution through common problem definition

- the first objective is of prime importance for the agency representatives here in Kamloops
- it is essential that the study be firmly grounded on a common information base and a shared perception of the problem rather than on the possibly erroneous assumption that such a shared background already exists
- such a grounding will also enable Secretariat staff and resource agency participants at the Victoria level to have a clearer perception of the issues and a better understanding of the choices that are possible and their accompanying implications
- the second objective is being effected by bringing together the principal agency participants in the region for a frank discussion of the problem and by giving them key roles in the Workshop: at the commencement they are being asked to provide a definition of the problem in their own terms; at the conclusion they are being asked to synthesize the information presented and generated at the Workshop and apply it to their respective management situations
- an attempt has been made to keep the Workshop schedule flexible
- it is structured, for the most part, around fifteen minute presentations by the speakers with time afterwards for questions and discussion
- I have asked speakers to provide one typed copy of their presentation or its essential content
- these will be compiled along with discussion notes - taken by John Dick of the ELUC Secretariat - and this record of proceedings will be circu-

lated to all speakers and participants at the Workshop

- I would like to clearly state at the beginning of the Workshop that all presentations and discussion notes are to be a matter of public record
- while members of the "public" per se were not invited to this Workshop, the proceedings are in no way to be considered confidential

- I should also mention that, as most of you are no doubt aware, this Workshop stems from a study of the interrelationship between high-elevation logging and caribou in the Raft - North Thompson which the ELUC Secretariat is coordinating
- the matter was forwarded by the Thompson-Okanagan Regional Resource Management Committee (R.R.M.C.) in Kamloops to the Environment and Land Use Technical Committee (the Deputy Ministers of the nine Ministries represented on the Environment and Land Use Committee of Cabinet*) in Victoria and from there it was referred to the Secretariat for coordination
- Fish and Wildlife Branch and the Ministry of Forests are involved at both the Working Group level in Kamloops and the Steering Committee level in Victoria
- it is our intention in the Secretariat to work and liaise with the R.R.M.C. in Kamloops as well and I hope to be able to present a status report on the study to the next meeting of the R.R.M.C.

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* the nine Ministries are 1) Agriculture, 2) Economic Development, 3) Energy, Mines and Petroleum Resources, 4) Environment (Minister chairs the Committee), 5) Forests, 6) Health, 7) Lands, Parks and Housing, 8) Municipal Affairs, and 9) Transportation, Communications & Highways.

2. Problem Identification

A. Fish and Wildlife Branch (R. Ritcey, Regional Wildlife Biologist)

i. Caribou/Habitat Relationships

--Caribou were once distributed throughout B.C. from north to south.

--In the southern portion of the province the species occurred over most of the higher elevation forests.

--Since 1900 the area of climax forests on which the woodland caribou depend has shrunk and, as a result, so have caribou distribution and numbers.

--Two reasons have been proposed for the decline in caribou numbers:

- -hunting/predation
- -habitat reduction.

Though both may have played a part in the caribou decline, habitat reduction is the most permanent.

ii. A History of the Present Conflict

--In 1969 the Fish and Wildlife Branch was asked to contribute to P.S.Y.U. planning. One of the Branch's recommendations was that there be no further logging in important caribou range. There was no positive response to this recommendation, and logging of high elevation forests continued at an accelerated rate.

--In 1973 the Branch delineated a caribou moratorium area above 5500 ft. elevation and requested no further logging in the area until critical caribou habitat could be defined. The proposed moratorium was rejected because of its effect on the annual allowable cut.

--In 1974 logging companies became concerned over the situation and the consulting firm Envirocon was asked to submit a study proposal. However, both the companies involved and the Forest Service said that they would not be bound by any study recommendations and, therefore, the Fish and Wildlife Branch decided not to support the study. Two other events occurred in 1974; first, the Forest Service hired Dave Freddy, a caribou specialist, who concluded after an analysis of the problem that caribou could not survive in the area if logging continued at its present rate, and second, Weyerhaeuser completed a five year plan in which 25% of the volume would be cut from within the proposed caribou moratorium and a further 27% from areas above 5500 ft. outside the moratorium.

--In 1976 the Fish and Wildlife Branch completed a regional caribou management plan. Important habitats in the Raft/North Thompson were delineated more precisely and other herds in the region were not to constrain forest harvesting. This proposal was rejected by the Forest Service.

--In 1978 the Forest Service rejected a final proposal by Fish and Wildlife Branch that would allow selection logging in 50% of the moratorium area. At the same time, the Forest Service indicated, for the first time, that they intended to log poor sites within the proposed moratorium area. At this point it became obvious that no resolution of this conflict could be achieved at the regional level and the R.R.M.C. passed the problem to the Environment and Land Use Technical Committee with a request that the ELUC Secretariat be involved.

iii. Caribou Population Trends

--During the 1930's, caribou numbers declined following wild fires at high and low elevations.

--Throughout the 1950's there was a gradual rise in population levels. Hunting seasons, which had been closed, were reopened.

--Herds peaked in the 1960's and thereafter have gradually declined. This decline has occurred in both logged and unlogged areas, but has been far more severe in logged areas.

--At present the caribou population of the region is approximately 400-450. These are distributed as follows: 300± in Wells Gray Park, and 100-140 in the Adams/North Thompson drainages.

Questions and Comments

Steve Tolnai, Weyerhaeuser: I would like to correct one of Ralph's statements. It was the Fish and Wildlife Branch that would not accept the consultant's study, not the Forest Service and Industry.

Ralph Ritcey: This is not correct. When the study proposal was made we asked the Forest Service whether they would be bound by the study recommendations and they said they would not. We felt that the study would, therefore, be a waste of money and did not support it.

Mike Wilkins, Ministry of Forests: What Ralph Ritcey says is quite true, the Forest Service was not willing, necessarily, to accept Envirocon's recommendations.

B. Ministry of Forests (Mike Wilkins, Ag. Assistant Regional Manager)

I have been asked to identify the problem from the Forest Service point of view, and I am sure that at this early stage of the workshop at any rate, the Forest Service and Fish & Wildlife Branches can agree that the problem lies in the basic incompatibilities of the timber extraction process and maintenance of critical caribou habitat, particularly winter ranges. The degree of this incompatibility is in my mind unclear, and hopefully this workshop will more clearly define this point.

For some 5 years now, the Forest Service and Fish & Wildlife Branch have held wide ranging discussions in order to find a compromise solution to the basic incompatibility between an industry that requires the wood fibre growing on areas deemed to be caribou habitat and the caribou themselves which require as a food supply the lichen contained within these same stands of timber. These extensive discussions have not provided the desired solution, which I think says something about the depth of the problem.

One obvious solution, of course, would be to prohibit the logging of the lichen bearing stands. I want to dwell briefly upon the reasons why this is not feasible.

As many of you know, the Forest Service is preparing new A.A.C. calculations based upon newly defined timber supply areas as required by Sections 6 and 7 of the Forest Act. Max Tanner will have more to say about this later, but I want to point out now that our initial projection for the Kamloops/North Thompson Timber Supply Area indicates there are likely to be serious wood supply problems. We, at the present time, are projecting an operable A.A.C. that is 100,000 C or 10 M M c.f. lower than our present level of commitment to the industry.

When faced with figures like this, you can readily appreciate the unacceptability of any solution that would withdraw significant areas out of the forest land base, thus significantly worsening the wood supply deficit.

There is another very good reason why this type of forest land withdrawal is unacceptable. Many of you are familiar with the new Ministry of Forests Act, but for those who aren't, I would like to refer briefly to Section 5.

Section 5 of the Ministry of Forests Act sets out the purposes, functions and obligations of the Forest Service. Subsection (c) is very clear in its commitment to the integrated planning and use of the forest and range resources.

Its specific applicability to our problem is obvious - we have no mandate to manage forest land for a single use, be it fibre production or wildlife habitat. We must rather manage our forest land on an integrated basis, keeping in mind the need of all resource values.

It is therefore clear that the solution to our problem lies in the willingness of the applicable resource agencies to accept trade-offs based upon relative values, both economic and social. Hopefully this workshop will more clearly define where these trade-offs may lie.

3. Basic Ecosystems/Ecosystem Productivity (Chris Clement, Resource Analysis Branch, Kelowna)

The entire study area falls within the Interior Wet Belt Region except for the most southern portion (south of Clearwater) which is within the Dry Interior Region.

Within the Dry Interior Region the following biophysical zones occur:
- Rocky Mountain Douglas-fir Biophysical Forest Zone
- Subalpine Engelmann Spruce-Alpine Fir Biophysical Forest Zone
- Alpine Tundra Biophysical Zone

Within the Interior Wet Belt Region the following biophysical zones occur:
- Western Hemlock - Western Red Cedar Biophysical Forest Zone
- Subalpine Engelmann Spruce - Alpine Fir Biophysical Forest Zone
- Alpine Tundra Biophysical Zone

The zones can be characterized in terms of climax vegetation in the following manner:

Rocky Mountain Douglas-fir Biophysical Forest Zone - climax cover of Rocky Mountain Douglas-fir, occasional shrubs, a moderately dense herb layer often dominated by pine grass and occasional mosses.

Western Hemlock - Western Red Cedar Biophysical Forest Zone - climax cover of western hemlock and western red cedar, sparse shrubs, variable amounts of shade-tolerant herbs and a thick moss layer.

Subalpine Engelmann Spruce - Alpine Fir Biophysical Forest Zone - climax cover of Engelmann spruce and alpine fir, an often dense shrub layer, a variable herb layer and a thick moss layer.

Alpine Tundra Biophysical Zone - climax cover of low ericaceous shrubs, hardy herbs, sedges and grasses.

It is the last two zones that are of prime importance for caribou habitat.

CLIMATIC PARAMETERS OF REGIONS AND BIOPHYSICAL ZONES

The Dry Interior Region is characterized by hot dry summers and cool dry winters. Precipitation varies from 360mm to 1100mm.[1]

The Interior Wet Belt Region is characterized by moist warm summers and cold winters with heavy snowfalls. Precipitation varies from 560mm to 2800mm.

The climatic characteristics of the biophysical zones are represented in the following table.

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[1] Precipitation data applies to the overall geographic distribution of regions and biophysical zones.

REGION	BIOPHYSICAL ZONES	CLIMATIC PARAMETERS[2]
DRY INTERIOR	Rocky Mountain Douglas-fir Biophysical Forest Zone	mean annual temperature - 4°C-9°C annual total precip. - 360mm-560mm % snow - 25 growing degree days - 1420 moisture deficit - 330mm
	Subalpine Engelmann Spruce - Alpine Fir Biophysical Forest Zone	mean annual temperature - 2°C-5°C annual total precip. - 410mm-800mm % snow - 50 growing degree days - See Note moisture deficit - See Note
	Alpine Tundra Biophysical Zone	mean annual temperature - ¯4°C-¯1.5°C annual total precip. - 700mm-1100mm % snow - 72 growing degree days - See Note moisture deficit - See Note
INTERIOR WET BELT	Western Hemlock - Western Red Cedar Biophysical Forest Zone	mean annual temperature - 3°C-8°C annual total precip. - 560mm-1700mm % snow - 53 growing degree days - 1153-1525 moisture deficit - 142-356mm
	Subalpine Engelmann Spruce - Alpine Fir Biophysical Forest Zone	mean annual temperature - 1°C-4°C annual total precip. - 600mm-1830mm % snow - 60 growing degree days - See Note moisture deficit - See Note
	Alpine Tundra Biophysical Zone	mean annual temperature - ¯7°C-¯1°C annual total precip. - 1100mm-2800mm % snow - 74 growing degree days - See Note moisture deficit - See Note

NOTE:
- No statistics given for Subalpine and Alpine zones.
- Growing degree days will decrease by 80 days/100 m. on average slopes.
- Moisture deficit will decrease by 40mm/100 m.

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[2] Climate data is from "Ecology of North America", V. Krajina, 1969 and R.A.B. Climatology Section.

LIMITATIONS TO PRODUCTIVITY

In this part of the presentation, I will consider the two Alpine Tundra Biophysical Zones as one and the two Subalpine Biophysical Forest Zones as one.

The primary limiting factors to productivity in any zone are length of growing season, available energy, precipitation, soil moisture, soil depth and soil nutrient status. The climatic conditions affect productivity at a regional or zonal level, while the soil factors have an effect at the site-specific level. For this reason I will briefly indicate the limiting climatic conditions within each zone.

The major limiting factor in the Rocky Mountain Douglas-fir Biophysical Forest Zone is low precipitation, which results in a moisture deficiency during the summer. Temperatures are generally moderate (may be high in the summer) and combined with high amounts of solar radiation this produces a moderately long growing season (1420 GDD).

In the Western Hemlock - Western Red Cedar Biophysical Forest Zone the growing season may be somewhat longer (1153-1525 GDD) because of higher precipitation. Deep snowpacks and the amount of rain falling between Spring and Fall usually prevent a moisture deficiency. Synonomous with the high precipitation are leached soils and low soil nutrient status.

The Subalpine Engelmann Spruce - Alpine Fir Biophysical Forest Zones have a shorter growing season (< 700 GDD), and high precipitation. Cool growing season temperatures, particularly in depressional areas such as cirque basins, may limit productivity. Snowpacks are deep and remain well into the Spring. Soils are highly acidic due to leaching in a cool environment.

The Alpine Tundra Zones have the shortest growing season (< 300 GDD) of the zones described. Wind exposure and solar radiation may create moisture deficiencies during the short growing season. In other areas snowdrifts and frozen soils further shorten the growing season. High ultraviolet radiation often reduces plant growth. Roughness of the soil surface, soil texture and soil depth often determine the amount of shrub and grass productivity. Lush herb growth is associated with seepage streams.

MANAGEMENT OPTIONS

The sustained yield principle is a major philosophy of forest and can be applied equally to wildlife management. In order to maintain caribou habitat, it is necessary to reserve an appropriate portion of the suitable forest for this purpose.

The key to multiple resource management is to maintain a diversity of ecosystems within the critical areas. These areas being old-growth subalpine forest and alpine tundra. In these old-growth forests it would be possible to recognize three landscape categories:

1 - active logging - productive timber (< 150 years old)
2 - recovery from logging (0 - 250 years old)
3 - climax forest (> 250 years old)

By maintaining a balance of these three classes of land the area could be managed effectively for caribou and the forest resource.

Comments and Questions

Tom Crowley, Okanagan College: Is there a climate station in the Alpine Tundra Zone in or near the study area?

Chris Clement: No. The data given here is an extrapolation of information presented in Krajina's paper.

Ray Travers, ELUC Secretariat: What are "growing degree days" and how good a measure of productivity is this parameter?

Chris Clement: A growing degree day is accumulated for each °C that the daily mean exceeds a base temperature of 5°C. These growing degree days are summed over a year and provide an indication of the period available for plant growth.

Ray Travers: Does the climatic data for the Alpine Tundra and Engelmann Spruce Subalpine Fir Zones apply more widely, or only to the Raft/North Thompson areas?

Chris Clement: This data is generalized for the entire geographic range of these zones.

4. Forest Capability/Productivity (Ron Kowall, Resource Analysis Branch, Kelowna)

INTRODUCTION

The procedure followed in determining the land capability for forestry was obtained from the Canada Land Inventory guidelines outlined by McCormack (1967, 1968) and Kowall (1971). As noted in these guidelines all mineral and organic soils were classified into one of seven forest capability classes based on their inherent ability to grow commercial timber. The forest capability classes were determined from productivity data based on the measurement of forest capability plots and from B.C. Forest Service inventory samples and were assigned to homogeneous land units provided by a soil and terrain survey.

FIELD WORK

The land capability for forestry program was carried out in conjunction with the soil and terrain survey under the supervision of a B.C. Registered Professional forester. The soil and terrain mapping was done on a reconnaissance basis with the mapping units delineated on approximately 1:60,000 scale aerial photographs. While field checking the accuracy of the mapping units, forest capability plots were located and measured in areas having uniform soil characteristics. Soil characteristics such as parent material, topography, drainage, and texture were considered and thrifty normally stocked 60 to 140 year old stands were required. For ease of comparison, all plots had their mean annual increments converted to the common base of 100 years.

MAPPING

With the completion of the soil maps, each soil association was assigned a forest capability rating based on the data from the forest capability plots and the B.C. Forest Service Inventory plots. Taking into account such characteristics as the biophysical forest zone, soil depth, soil moisture, soil parent material and aspect, the soil mapping units were assigned a forest capability class, or range of classes, limitations to forest growth were identified and the most productive species determined. The forest capability map boundaries are the same as those used on the soil maps. Where adjoining soil units had the same capability, the soil boundary was omitted on the forest capability map. The forest capability classes in this area ranged from the lowest of class 7 to the highest - class 1. Forest capability mapping in the study area has only been completed in map sheets 82M and 92P. Therefore, forest capability maps at a scale of 1:50,000 are available for virtually all of the Raft P.S.Y.U., but only for the southern one-quarter of the North Thompson P.S.Y.U.

RESULTS

In the areas above 1525 meters (5000 feet), which is in the Subalpine Engelmann spruce-alpine fir biophysical forest zone(Engelmann spruce-subalpine fir biogeo-climatic zone), the forest capability grades from class 4 at the lower elevations to class 7 in the high, alpine areas. These areas are, therefore, capable of growing trees, mainly Englemann spruce and alpine fir, at a rate of less than 5.0 cubic meters per hectare per year (70 cubic feet per acre per year). These figures represent total tree volumes per acre and do not take into account any merchantability factors. The main limitation to tree growth at this elevation is climate where soil limitations are minor. Cold soil temperatures and a short growing season (H) are the main climatic limitations and shallow soils overlying bedrock (R) and excessive soil wetness (W) are the main soil limitations. Class 4 occurs generally between 1525 to 1750 meters (5000 to 5700 feet) on deep, moderately well drained soils. On shallow or wet soils the capability decreases to class 5 or even class 6. Above 1750 meters to the Krumholz subzone, deep, moderately well drained soils are generally class 5 which decrease to class 6 where shallow or wet soils occur. The soils in the Krumholz and alpine areas and organic soils have a capability of class 7.

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Comments and Questions

None

At this point, because the programme was running ahead of schedule the chairman opened the floor to general comments and questions prior to adjournment for coffee:

John Dick, ELUC Secretariat: I would like to address a comment to Mike Wilkins; however, it appears that he is not present so perhaps Ralph Johnston could reply. Mike alluded to the new Forest Act not allowing areas to be set aside for "single use" because of the integrated use philosophy of the Act. This would seem to be a return to the old "multiple use" concept discredited a decade ago. Integrated use is applied to a management unit (i.e. P.S.Y.U.) as a whole and implies that certain areas will be set aside for "single uses", whether wildlife, watershed or intensive timber production.

Ralph Johnston, Ministry of Forests, Kamloops: I agree that the designation of forest areas to single use is consistent with the Act, depending of course, on the size of the area requested.

Bob Weinard, Northwood Pulp Ltd.: My question is directed to Ralph Ritcey. You stated that large fires in the 1930's depleted caribou habitat and thus reduced herds. You then went on to say that numbers peaked again in the 1960's. Does this mean that the adverse effects of the fires had disappeared in 35 years?

Ralph Ritcey: That is a good question. If one took literally what I said, this could be the conclusion. However, the peak in the 1960's was far lower than in earlier decades. The recovery here was to the carrying capacity of the remaining range.

Max Tanner, Ministry of Forests, Clearwater: What are your objectives in terms of caribou numbers?

Ralph Ritcey: Our present objectives are limited to population maintenance. In terms of numbers, this would be approximately 400 animals in the region.

Max Tanner: What does this translate to in terms of area of habitat required?

Ralph Ritcey: The present area of high elevation climax forest, maintained over time, would support this population size.

Wally MacGregor, Fish and Wildlife Branch, Victoria: What is the regional caribou population estimate for the early 1960's?

Ralph Ritcey: We have no reliable estimate but it probably ranged between 600-800 animals.

Marty Beets, Fish and Wildlife Branch, Williams Lake: I would like to direct a question to Ralph Johnston. In reply to John Dick's comment you said that the Ministry of Forests would be willing to set forest areas aside for other uses "depending on size". What do you mean by this?

Ralph Johnston: Obviously an area of such a size that it seriously affected forest management in a P.S.Y.U. would be unacceptable. However, the Forest Service is willing to set aside areas for other uses and each proposal would be judged on its own merits.

Grant Gunn, Weyerhaeuser Canada, Vavenby: What has been the Fish and Wildlife Branch's policy on hunting of caribou?

Ralph Ritcey: Prior to the mid 1960's access in the region was generally very poor. Hunting seasons were long and both sexes were hunted. Annual harvest during this period was ±50 animals, about 10% or less of the population. In response to increasing access there have been a number of reductions in the length of hunting seasons and the elimination of seasons on cow caribou. Present harvest is approximately 3-4 animals, or ±1-2% of the population. Late winter recruitment rate has been averaging over 10% annually. Thus it is apparent that something other than hunting mortality is responsible for population decline. In addition to the more restrictive regulations I've just mentioned, I should add that four management units will be completely closed and dedicated primarily to non-consumptive uses.

Conny Crowley, Okanagan College: What is the magnitude of the illegal kill?

Ralph Ritcey: This is difficult to determine, of course, but this past year we had a legal harvest of four animals and an illegal kill of five that we knew of.

5. Caribou Habitat: Arboreal lichen/Forest Relationships

(Susan K. Stevenson, Consultant Biologist, Prince George)

In the summer of 1978 a research project was begun which has the long-term goal of assessing the effects of selective logging on the arboreal lichens *Alectoria* spp. and *Bryoria* spp. These green and brown "beard lichens" are the main winter food of the woodland caribou which inhabit the mountains of southern British Columbia.

The study area is located in the Selkirk Mountains of B.C., near the Washington-Idaho border. The area is within the range of a herd of 25-30 caribou — the only caribou remaining which frequent the United States outside of Alaska — which depend on mature, lichen-bearing engelmann spruce/subalpine fir forests for their winter habitat. Because of the heavy demand for mature timber in the Creston P.S.Y.U., government agencies and industry are motivated to develop a logging program that will permit timber harvest without destroying the caribou population. In 1977, Kootenay Forest Products began an experimental program of diameter-limit logging in caribou range according to a prescription designed to remove about 40% of the stems. I was hired to initiate a research program evaluating the effects of the logging on forage lichens. My objectives were:

1. To determine the immediate effects of selective logging on lichen availability, including the effects of varying the logging prescription.
2. To determine how much lichen is presently available with enough precision that the data can serve as a baseline for future monitoring.
3. To develop improved methods for quantifying biomass of arboreal lichens in an intensive study, and to recommend methods for use at an inventory level.

The project was funded co-operatively by the B.C. Forest Service, Kootenay Forest Products, and the B.C. Fish and Wildlife Branch.

Using a combination of ratio estimation and variable probability sampling, I quantified lichen biomass on the lower six meters of standing trees in four 0.1 ha plots. One plot had been logged the previous summer, two were scheduled for logging during the following autumn, and the fourth, a control plot, was to remain undisturbed.

Total amounts of forage lichen within reach of caribou in the three unlogged plots were 67 ± 37 kg/ha, 103 ± 21 kg/ha, and 105 ± 37 kg/ha. This forage base is relatively low, both in terms of the herd's estimated food requirements, and compared with other caribou ranges.

In the mature timber plots approximately half the lichen biomass was contributed by subalpine fir, which bore an average of 310 g/tree of lichen. Spruce bore an average of 206 g/tree, and contributed about 30% of the total lichen biomass. Snags bore on the average only 135 g/tree, but made a substantial contribution to total lichen biomass -- about 17%. Trees smaller than 7.1" DBH bore very little lichen.

The cutting prescription planned for the study area was 20" diameter at stump height (equivalent to 16" DBH for subalpine fir and 15" DBH for spruce). Application of this prescription is expected to result in the harvesting of about 70% of the merchantable timber volume, or about 30 cunits/acre. Theoretically, 48% of the lichen originally present on merchantable trees would remain. If the prescription were raised to 24" DSH, 68% of the original lichen would remain, but only about half the merchantable timber (about 22 cunits/acre) would be harvested. A reduction of the prescription to 16" DSH would increase timber harvested to 91% (about 39 cunits/acre), but would dramatically reduce residual lichen to only 15%.

Increasing the diameter limit for subalpine fir to 24" DSH and lowering it for spruce to 14" DSH would increase residual lichen by only about 5%. Total volume harvested would not change significantly, although the species composition of the cut would be altered. The gain in lichen biomass obtained by raising the subalpine fir cutoff point from 20" DSH to 24" DSH is nearly offset by the loss of the spruce in the 14" - 20" DSH range.

To assess the overall effects of diameter limit logging on lichen biomass in the study area, it is necessary to consider that some lichens are knocked off residual trees during falling, that a portion of the block is effectively clearcut for roads and landings, and that most snags are felled. Considering these factors, selective logging to a 20" DSH limit is expected to reduce available lichen to about 26% of its original amount, or to 12 - 32 kg/ha. Lichen biomass found in the plot that had been selectively logged the previous summer (18 kg/ha) falls within this range. Residual lichen could probably be increased by about 3% if guidelines for reducing site disturbance are followed.

In the Selkirks, quantities of lichen available to caribou are much lower than those reported by Edwards, Soos and Ritcey for Wells Gray Park. Food quantities are also relatively low in terms of the forage requirements of the animals; the caribou must range over a relatively large area to meet their needs. Observations in the south Selkirks suggest that the animals tend to concentrate in particular winter ranges, but that they rotate their use. This strategy probably allows the caribou to satisfy their forage requirements without wasting energy, while allowing the lichens time for regrowth on other winter ranges. It also makes it difficult for wildlife managers to identify ranges that are critical to the animals.

Because of the relatively low levels of lichen biomass available to Selkirk caribou, removal of nearly 3/4 of the lichen in a stand is a serious alteration of habitat. I recommended that in the range of the Selkirk herd, no logging be permitted in areas where caribou concentrate in winter. Selective logging should be restricted to areas used by caribou for travel.

If logging is necessary in caribou range, selective logging has several advantages over clearcut logging. First, caribou do use residual timber; I have observed signs of caribou travelling through logged areas in winter and feeding on lichens from residual trees. Second, a selectively logged block is expected to regain its former level of lichen biomass in much less time than a clearcut block. Third, it is possible that lichen growth rates may be enhanced in some partially cut stands because of the increased light. Future assessment of lichen biomass in the plots established in this study will help to clarify the long-term effects of selective logging on lichen abundance.

Questions and Comments

Randy Chan, Balco Industries Ltd.: What percentage of the total tree lichen load is that portion under 6 metres?

Susan Stevenson: I'm sorry, I can't answer that question. What data I have indicates a high degree of variability.

Steve Tolnai: Was I correct in interpreting you as saying that one hectare of climax forest would supply one animal with its food requirements for 2.5 days?

Susan Stevenson: Yes, that is correct. This estimate assumes that the animal ate so as not to deplete the range and takes into consideration the estimated growth rate of the lichens.

Mel Monteith, Ministry of Forests, Clearwater: While logging to an 8" diameter limit may not be the best for caribou, don't you feel that it's preferable to clearcutting?

Susan Stevenson: Yes, but given the very low lichen loads of these smaller trees, I feel that the gain, at least in the short term, is marginal.

Mel Monteith: Is there a release effect on lichen growth from partial cutting?

Susan Stevenson: While we have no real data, I feel that there probably is a release effect but that it's only significant on sites that are mesic or moister.

Sandy McDonald, Fish and Wildlife Branch, Kamloops: Is it possible to tell whether lichens have been browsed off a tree or whether they were not there to begin with?

Susan Stevenson: It's a very difficult, subjective judgement.

Sandy McDonald: What have been the silvicultural effects of diameter limit cutting in the Selkirks?

Susan Stevenson: I'm not really the one to answer this question and I don't believe that anyone is here from the Nelson Forest Service.

Rod Willis, Weyerhaeuser Canada, Vavenby: I would like to make a comment on selection logging at high elevation. As a forester I abhor it. I'm not convinced that we can grow a merchantable timber crop after selection logging. I must add, however, that my opinion is not shared by all foresters - some agree, some don't and others are reserving judgement.

Ray Travers, ELUC Secretariat: With reference to the figure of one hectare of climax forest supplying the needs of one animal for 2.5 days, this is only for the season of high snow-pack isn't it, and not for the whole year?

Susan Stevenson: Yes that is correct. But I would like to caution that this figure is rough, and specific to my study area. I would not want too much reliance placed on this number. It gives only a very general picture of the relationship.

Ray Travers: I understand your reservations but the figure does give some guidance on the level of habitat utilization. One further question; can we make any general judgements on the types of parameters that control lichen growth? More specifically, what stands are better and what management prescriptions might enhance lichen productivity?

Susan Stevenson: We have no quantitative information now. In fact, the objective of this Selkirk study is to test a number of hypotheses.

Ted Antifeau, Fish and Wildlife Branch, Kamloops: We have undertaken a very preliminary study looking at lichen loads in different types of stands. One of the more interesting results was that lichen loads per unit area are fairly uniform at these elevations. In more open stands, there is a higher lichen load per tree.

Grant Hazelwood, Parks Branch, Victoria: I have seen some indication that caribou utilize other plant species as winter food as well as lichens, i.e. shrubs, the ends of branches, etc. Do you have any information on this?

Susan Stevenson: I've done no work on food habits. My references are Freddy, Ritcey and Edwards, Schroeder and others. There seems little doubt, however, that during deep snow months in the Southern Interior arboreal lichens are overwhelmingly the main source of food.

Sandy McDonald: Are there nutritional differences between the various species of arboreal lichens?

Susan Stevenson: Some information generated by Schroeder in the Selkirks and my own experience on Vancouver Island would indicate that Bryoria is higher in protein content than Alectoria by about 1.5 times.

Ralph Ritcey: Have you any information on the age distribution of stands after selection cutting?

Susan Stevenson: No, this work hasn't been done yet.

Ralph Ritcey: We believe that windfalls are most important for caribou during certain times of the winter. Our greatest fear of diameter limit cutting is that it removes future windfalls.

Ray Travers: Has selection logging any effect on the nature of the snowpack?

Susan Stevenson: A good question. I am sure that it has and that it is bound to be important for caribou. For this reason, one of the recommendations of our study is that this question be investigated.

Ralph Ritcey: I believe that selection logging would serve to make the snowpack firmer and therefore it would tend to enhance caribou mobility.

Susan Stevenson: The more I read about snowpack, the more I realize that it is a very complex phenomenon. I would reserve judgement at present on whether the effects would be good or bad for caribou.

6. Logging/Caribou Relationships in the Prince George Area (Bob Weinard, Northwood Pulp Ltd.)

A basic rundown of our harvesting volumes by species, age, and Sustained Yield Unit is as follows:

522,000 cunits in the Prince George area

70% S, 20% B, 10% Pl & F., 150-250 years old,
through 4 S.Y.U.'s and 1 T.F.L.
3 of the S.Y.U.'s have Caribou.

411,000 cunits in the Houston area

31% S, 28% B, 41% Pl, 120-220 years old,
through 4 S.Y.U.'s
1 S.Y.U. has Caribou.

Our company policy is to recognize other resources and make provision for other resource users where possible, as well as to make intelligent decisions through research work in other fields.

We are studying Caribou in order to plan and operate more effectively where Caribou habitat is involved.

The original study covered the period September 1, 1975 to March 31, 1978. Initial budget was $36,370, shared 50/50 on a joint basis with the Fish & Wildlife Branch.

The study was named, Habitat Utilization and Food Requirements of Mountain Caribou and the Impact on the Forest Industry.

The study was later expanded to, The Ecology and Status of Mountain Caribou and Caribou Range in Central British Columbia (316 pages).

This was the basis for a thesis for a Masters of Science in Wildlife Productivity and Management.

The most predictable trait uncovered as the study progressed was the unpredictability of Caribou. We were making all kinds of rash statements and conclusions the first year.

However, by the second year, we were still somewhat confused; and by the end of the third year, we decided that while a final report was forthcoming, we should continue as we were only just beginning to really understand some of the unusual habits of a very unusual animal.

The main points still under study are:

1) calving sites, and

2) late spring and fall ranges (brief periods, but critical and including the use of terrestial lichens).

Susan Stevenson is presently consulting on this section.

For interest, during the initial study, 87 observations totalling 222 animals were made. From the study expiry date to the present, 20 more observations of 91 animals have been made.

This involved many duplicate sightings however, and we estimate about 66 Caribou were involved on 8 distinct mountain ranges. Here are some comments from Micheal Bloomfield's abstract.

> Mountain Caribou were studied in Central British Columbia from September, 1975 to December, 1977. Population studies examined seasonal and social habits, distributional patterns and developmental impacts.
>
> Caribou demonstrated seasonal preferences for elevation, aspect and habitat. Nearly 50 percent of observations occurred between 1350 and 1700 metres. High elevations were preferred during summer and late winter. Valley bottoms were most important during spring, early winter and autumn. Aspect preferences were related to habitat, season and inclination. Twenty percent of sightings occurred on northwest exposures. Southwest and north aspects followed, comprising 16.8 and 15 percent of observations, respectively. During winter, Caribou selected northeast, northwest, southwest and east facing slopes, alpine fir-spruce and cedar-hemlock-spruce forests and subalpine meadows. Cedar-hemlock-spruce forests were preferred in early winter and on northwestern slopes.

Alpine fir-spruce forests were important for each season and aspect. Use of subalpine meadows was greatest between April and November and on southerly exposures. Moderate slopes were preferred.

Food habits were determined from feeding site and fecal fragment analyses.

Numerous forage species were used seasonally. Except in late and mid-winter, forbs constituted the major forage group. Aboreal lichens accounted for 17.3 percent of the annual diet. However, variability by season and habitat was high. Caribou primarily relied on aboreal lichens for winter forage, particularly late in the season. (April).

Average groups consisted of 2 to 5 Caribou; rutting and wintering groups being the largest (8 to 11, 5 to 9). Even the most liberal population estimates do not exceed 500 to 600 animals.

Historic evidence suggested great mobility. Caribou were known to range over an area of at least 48 kilometres.

The Caribou decline was attributed to the cumulative effect of several factors. Habitat destruction, increased access and recreational hunting played principle roles. The critical decline period probably occurred between 1960 and 1974. Logging disrupted normal movement patterns and destroyed lichen-bearing forests. Access increased latent Caribou susceptibility to over-harvests, and liberal harvests approached and exceeded annual calf increments. Cow hunting seasons reduced the calf producing cohort and transmission of herd traditions. Other factors, particularly aircraft and all-terrain vehicle harassment and hydro electric developments, may pose potential threats in the future.

Caribou survival is contingent upon maintenance of critical habitats and elimination of hunting seasons. Timber harvest practices and land use policies should be changed to reduce conflicts with Caribou management. Furthermore, introduction of new, disturbing influences should be avoided.

The slide presentation is next. - 15 MIN.

Final Remarks

1) Caribou are very erratic and restless movers although they tend to stick to basic mountain ranges during the mid-winter period of January, February and March.

2) There is no shortage of habitat at present although,

   a) critical habitat must be identified (which we have done to some extent) for existing animals,

   b) habitat requirements for any herd increases should be examined and decisions made accordingly. This may be the knottiest problem of all.

3) Migration routes are not clear, well defined, hard-packed trails, but rather a loose pattern of movement through a fairly broad area.

Questions and Comments

Steve Tolnai, Weyerhaeuser Canada: I would like to point out that in our area we have considerable merchantable timber in the zone between 5000 and 6000 ft., unlike Prince George. Therefore, while Bob can propose reservation of this area for caribou, it is not a viable alternative for us.

7. Logging/Caribou Relationships in the Raft-North Thompson: Diameter Limit Logging (Mel Monteith, Ministry of Forests, Clearwater)

To simplify my talk I have divided the spruce balsam types into two categories. These categories are single storied and two storied stands. Both types may or may not have a low understory of somewhat suppressed regeneration.

In the two storied stand we usually have a very overmature overstory with many dead tops and snags. The second story is younger with a good potential for release when the overstudy is removed. It is in this stand that I feel we should eliminate the overmature timber leaving us a stand with a good potential for another cut in a short time, maybe 20 to 40 years. This is a stand in which diameter limit logging is possible.

The second type, the single storied stand or almost even aged stand has trees from 8 inches and overall more or less the same age. This stand is mature but not yet overmature and has fewer snags. This stand may also have an understory of immature trees. This area should be logged to 8 inches with protection for the immature. In some spots we may also have to fill in plant.

Over the past few years we have experimented with various cutting procedures. These experiments were in co-operation with Fish and Wildlife, Clearwater Timber Products Ltd. and Weyerhaeuser Canada Ltd.

These experiments were mainly variations on diameter limit cutting. On one area we varied the diameters from 8 to 14 inches on various blocks to see what the residual stand would be like. This was mainly for caribou rather than good timber management.

One area with two blocks was designed to leave 40-50% of the stems. This worked out to 14 inches cutting diameter. This treatment was so successful with Fish and Wildlife that the two blocks were converted into a strip with the strip cut to a 14 inch diameter. The original area of each block was approximately 60 acres with a total of 120 acres. After it was converted to a strip the total area became 250 acres. I mention this not from caribou or timber management but as pure economics. With 110 chains of road we logged at first only 120 acres but later 250 acres which would indicate quite a saving in road construction costs and so a greater return to the Province.

This block or strip was done as an experiment. I feel from a timber management or good silviculture practice it should have been cut to 12 inches rather than 14. It is somewhat a silvicultural slum.

On some of our 8 inch diameter limits we are saving up to 2000 stems per acre. Many areas however have cleared patches which will require fill in planting.

Now the problems with this type of stand treatment. First on the 8 inch cut with residual protection. If you are fortunate as we are, the small suppressed trees will release. This does give us quite a jump on reforesting this area specially at high elevations. The fill in planting when required is also protected by the established trees.

The other problem we run into in the higher diameter cutting is blowdown. Some recommendations are only cut 30% in selective logging to limit the blowdown. We have changed some of our 12" cutting to 8 inch after logging commenced due to wind breakage and blowdown.

In the viewpoint of economics we should take a close look at all factors affecting the costs. Road construction is costly in wet belt areas and it takes the road area out of production for a long time. As we now see it our average road costs are approximately $6.00 per C.c.f. If you allow for 1/3 reserve on all blocks or possibly 12 inch cutting diameter the road costs increase to $8.00 or $9.00 per C.c.f. This is for block layouts. Looking at strip systems for clearcut our road costs could drop to $3.00 per C.c.f. and with diameter limit maybe $5.00 per C.c.f.

As has been mentioned in various studies. the roads are our main problem areas for erosion and other disturbances. If we stay with blocks and diameter limits we may require twice as many miles of road as is necessary for other logging systems for the same volume of wood. This will not cost more but will take that much more area out of production for a longer time.

Questions and Comments

Bob Weinard, Northwood Pulp Ltd.: Has your logging been done with conventional equipment?

Mel Monteith: For the most part yes, and satisfactorily. Much depends on the level of concern of the operator.

Bob Weinard: Did you experience any significant damage to the residual stand?

Mel Monteith: No.

Sandy MacDonald: Fish and Wildlife Branch was happiest with the 14" diameter limit but this appeared to be unacceptable to the Forest Service. Why?

Mel Monteith: While the 14" diameter limit may have been best for caribou it could not always be expected to give satisfactory silvicultural results. The use of this particular diameter limit will depend on stand characteristics. It may be used in some areas but not in most.

Sandy MacDonald: Some long-term commitment is necessary on the residual stand, otherwise diameter limit cutting is a short term solution only because in a few years time you'll go back and clearcut the residuals.

Mel Monteith: This is true to a certain extent, but there will still be leave-blocks of overmature intact. I would agree though, that we should be striving for a long-term solution acceptable to both parties.

Steve Tolnai, Weyerhaeuser Canada: One point that seems to be missed is that between 20 and 40% of the area will not be logged in the first and second passes. This area will consist of low sites, certain poor sites, stands fringing bogs and wet meadows, and younger age classes. We should be looking at providing movement corridors between these areas.

John Dick, ELUC Secretariat: Have you determined the proportion of lichen load left in the various diameter limit cuttings, i.e. 8", 10", 12" and 14"?

Ralph Ritcey: Perhaps I can answer that question. No we have not as yet done a comparative study of this type. I would consider it a priority study which should be set up in such a way as to provide information also on subsequent lichen productivity in the thinned stands. We do know that the 14" diameter limit removes about 50% of the lichen load from a stand. One other comment I'd like to make about selective cutting is that it preserves the habitat of other species besides caribou, such as pine marten.

Ray Travers, ELUC Secretariat: What is the quality and quantity of the residual stand?

Mel Monteith: This has been highly variable in the stands we've treated. Stocking has varied from 300-2000 stems per acre. The general quality of the residual stands could be greatly improved with a little follow-up spacing.

Ray Travers: You indicated that there was the potential for a second cut from these stands in about 40 years. What size of trees are you envisaging?

Mel Monteith: If present diameter increments following release in the two-storied stands are sustained, I would anticipate trees of about 30" D.S.H. in 40 years.

8. Logging/Caribou Relationships in the Selkirks

(Ken Sumanik, Fish & Wildlife Branch, Nelson)

Caribou-logging conflicts emerged over ten years ago with the focus being large clear cuttings in upper Monk, Curtis, Carolina, Elmo and Next Creeks.

Attempts at resolution began six years ago with the establishment of the International Mountain Caribou Technical Committee. This organizaton comprised of loggers, sportsmen, academics and forest and wildlife managers prepared a mission statement which defined its terms of reference and it proceeded to examine the impacts of logging and other activities on the small Selkirk caribou herd. Canadians and Americans have been involved in this program because the caribou inhabit areas in both countries.

The enclosed mission statement clearly defines the responsibilities of the committee.

Field studies under the supervision of academic staff of the University of Idaho, funded largely by the U.S. Forest Service and other members of the committee, were initiated in 1971 and have carried on to the present.

1. David Freddy conducted an ecological study of the herd and used the dissertation as partial requirement for his M.Sc. University of Idaho.
2. Dr. Donald Miller, studied rutting behavior and fall dispersion.
3. Gary Schroeder undertook a lichen study but did not complete it because he withdrew from the university.
4. Jeff Yeo and Buck Feldman have worked on caribou habitats and have produced maps on the subject. A short film was produced summarizing the history and status of the herd.

Other work included Dave Freddy's efforts in Canada as an employee of the B.C. Forest Service. Freddy expanded his thesis subject and examined possible caribou-logging conflict areas.

Information which had been required to this point was used to develop a set of Caribou-Logging Guidelines; primary authors were Miller, Johnson and Peck.

Susan Stevenson, with the help of a summer student, undertook a lichen biomass-logging study in summer 1978. This study was funded jointly by B.C. Forest Service, Kootenay Forest Products and Fish and Wildlife.

All studies have helped to provide information needed to make decisions about logging in the upper reaches of Monk and Crutch Creeks.

A field tour was conducted last fall over the area slated for logging; at that time Susan Stevenson provided all participants with a candid and informative summary of her study. The report is presently in its final stages of completion.

Central to the Selkirk and Raft-Thompson caribou-logging conflicts are the problems of forest resource commitments which in turn have been complicated by Hydro-electric developments, land withdrawals and establishment of annual allowable cuts which are subject to some criticism.

Obligations are still not fully understood within and outside government agencies and seriously impedes joint decision-making particularly where caribou-logging conflicts are concerned.

Better information is still needed to help sort out specific problem areas and special attention should be paid to acquiring pertinent information.

Research should be directed towards wildlife-forestry inventory, capabilities, productivity and the impacts of certain activities including forest harvesting practices on caribou.

Three options exist:

(1) Withdrawals from the forest base of very specific areas (ie. licks, rutting grounds, calving grounds and critical feeding and cover areas.

(2) Deferrments from forest harvesting, migration and general feeding areas; until prescription and harvesting perofrmance can be improved.

(3) Different silvicultural treatments in areas peripheral to but not absolutely essential to mountain caribou.

Some combination of these three options must be derived so it is essential that all participants create the kind of forum needed to acquire and exchange information and make choices.

My personal opinion is that the situation is not nearly as hopeless as one might surmise; however it is still a long way from being resolved to everybody's satisfaction.

I would like to propose that we establish a B.C. Mountain Caribou Committee similar to the International Mountain Caribou Technical Committee to help us facilitate making the kinds of choices needed to reduce the overall caribou-logging conflict.

MISSION STATEMENT: INTERNATIONAL MOUNTAIN CARIBOU TECHNICAL COMMITTEE

Background

The Selkirk Mountain Caribou Herd is a relic of a potentially endangered subspecies of caribou--the only known representative of wild, free-ranging caribou in the United States and the only known herd which regularly crosses the International Border between British Columbia and the states of Washington and Idaho.

Since the late 1960's, interest in the welfare of these caribou has grown. In 1971, the first of two cooperative agreements to investigate and monitor the Selkirk Mountain Caribou Herd was signed by representatives of the Intermountain Forest and Range Experiment Station and Region 1, U.S. Forest Service; the University of Idaho; the Washington State Department of Game; the Idaho Game Department; and the British Columbia Fish and Wildlife Branch.

As a result of these cooperative agreements, a number of graduate studies of the International Caribou Herd have been conducted, and interest in the herd has continued to grow. During the past four to five years, the Steering Committee for the Cooperative studies has also served as a technical advisory committee for a number of Canadian and United States Federal, Provincial, State and private agencies who share management responsibilities in the geographic area occupied by the International Mountain Caribou.

Because of the widespread interest in the caribou, the composition of the International Mountain Caribou Technical Committee has been expanded beyond the scope of the original research agreements to include representatives of sportsmen's groups and several private lumber companies. Hence, this Technical Committee has superceded the International Mountain Caribou Steering Committee as a source of information on the Selkirk Mountain Herd.

Mission

The mission of the International Mountain Caribou Technical Committee is to provide an avenue for the dissemination of information that will effect sound management decisions and ensure that the mountain caribou will remain as a natural inhabitant of the Selkirk Mountains in Canada and the United States.

Individual members or agencies of the International Mountain Caribou Technical Committee will continue agreements to conduct research and monitor the status of the caribou, and the Committee will continue to advise on areas where research is needed; but the major function of the Committee is to promote acceptance of adequate caribou management programs and to coordinate existing knowledge into management recommendations.

The Committee's intent is to serve as a catalyst for proper management of the Selkirk Mountain Caribou Herd. The Committee cannot circumvent the various agency responsibilities and will not function as a lobby of an individual agency or agencies represented.

Membership

The International Mountain Caribou Technical Committee is a self-governing pool of expertise from both management and research. It includes a representative group of Canadian and United States Federal, Provincial, State and private individuals with an interest and knowledge about the mountain caribou and its habitat. Membership is open to all qualified individuals.

Questions and Comments

Ray Travers, ELUC Secretariat: You refer to a "reasoned choice". What do you mean by this?

Ken Sumanik: A reasoned choice is one that is as consistent as possible with the management and maintenance of all forest resources.

Ray Travers: Are wildlife managers able at this point in time to give us the baseline prescriptions that will allow maintenance of forest wildlife?

Ken Sumanik: Yes, but keep in mind that in the Kootenays the baseline information was gained cooperatively by foresters and wildlife biologists. Many foresters there are as concerned about the management of forest wildlife as the biologists and this is a healthy, optimistic sign.

Steve Tolnai, Weyerhaeuser Canada: There are concerned people in Kamloops too, but others are more interested in particular causes than with seeing both sides of the problem.

9. Timber Supply Analysis, Kamloops-Thompson Timber Supply Area

(Max Tanner, Ministry of Forests, Clearwater).

There was a white paper which was published in July 1978 titled "Yield Regulation within Timber Supply Areas". Copies of this paper are available by writing:

Information Services,
Ministry of Forests,
1450 Government Street,
Victoria, B.C.
V8W 3E7

Five objectives are listed for timber supply areas:

1. Maintain community stability
2. Balance supply and demand for wood
    - flexibility gained from scheduling harvest and management activities over a larger area.
3. Provide continuous wood supply
4. Obtain logical wood flow
5. Provide administrative advantages by consolidating tenures
    - licences formerly had one tenure for each PSYU

Kamloops - Thompson Timber Supply Area

(Includes North Thompson, Raft, Barriere, Niskonlith, Nehalliston portion of Kamloops and Adams PSYU's and T.F.L. 18 and 35)

Table # 1

Present Sources Of Timber Supply (Ccf)

Company	Present Commitment by P.S.Y.U.				Private Wood	Total
	P.S.Y.U.	T.S.H.L.	T.S.L.	T.F.L.		
Evans Products Co. Ltd.	Big Bar	36,013	5,000			
	Botanie	35,827	5,000		10,000	91,842
Weyerhaeuser Canada Ltd. Kamloops Div.	Kamloops	22,800	4,370	31,950	8,000	
	Barriere	4,827	750	(TFL 35)		
	Nehalliston	5,933	28,840			
	Niskonlith	10,227	7,670			125,367
Balco Industries Ltd.	Kamloops	51,333	9,250		20,000	
	Niskonlith	11,307	28,480			
	N. Thompson	24,840	6,140			151,350
Fadear Creek Lumber Co. Ltd.	Barriere	50,307	24,660			
	Nehalliston	20,453	31,840		7,500	134,760
Gilbert Smith Forest Products Co. Ltd.	Barriere		2,510			
	Adams		11,700			
	Nehalliston		12,400			
	Niskonlith		392			
	Raft		7,000		1,000	35,002
Holding Lumber Co.	Adams	58,760	32,910			
	Niskonlith	6,253	4,670		21,000	123,593
Clearwater Timber Products Ltd.	Adams	8,907	25,000	74,000		
	Raft	39,893	29,850		12,993	190,643
Weyerhaeuser Canada Ltd. (Vavenby)	Adams	2,000	1,500			
	Raft	24,387	18,290			
	N. Thompson	38,413	13,742		50,000	148,332
Canyon Creek Sawmill	N. Thompson	5,393				5,393
	Total	457,873	311,964	105,950	130,493	1,006,280

Kamloops - Thompson Timber Supply Area

Table # 2

1 Industrial* Capacity (Ccf)	2 Approximate Allowable Annual Cut (Ccf)	3 Approximate** Operable A.A.C. (Ccf)	4 1975 - 1977*** cut figures (Ccf)	Deficit (Ccf)		
				4-3	1-2	1-3
1,058,483	1,009,522	770,676	856,831	86,155	48,961	287,807

Table # 3 Kamloops - Thompson Timber Supply Area

1 Industrial* Capacity (Ccf)	2 Approximate AAC & private wood (Ccf)	3 Approximate** operable A.A.C. and private wood (Ccf)	Surplus (Ccf) 2-1	Deficit (Ccf) 1-3
1,058,483	1,155,015	916,169	96,532	142,314

Table # 4 Kamloops - Thompson Timber Supply Area

Crown Committment**** (Ccf)	Approximate** Operable A.A.C. (Ccf)	Deficit (Ccf) 1-2
875,787	770,676	105,111

* Industrial Capacity figures are based on 1976 Mill Manufacturing figures and 440 shift basis.

** Operable Allowable Annual Cut is based on additional reductions to gross allowable annual cut ie: environment protection areas, non-recoverable losses, non-merchantable timber types. This figure is based on local knowledge and should be a more realistic allowable cut.

*** 1975 - 1977 are licensee cut figures from 1975 to 1977 inclusive.

**** Crown committment is the existing crown committment in the form of Timber Sale Harvesting Licence, Timber Sale Licence and Tree Farm Licence.

Northern Supply Block Within
Kamloops – Thompson Timber Supply Area

(Includes North Thompson, Raft and portion of Adams P.S.Y.U. and T.F.L. 18)

Table # 1 Northern Supply Block Present Source of Timber Supply

Company	Present Committment (Ccf) T.S.H.L.	T.S.L.	T.F.L.	Private (Ccf)	Others(Ccf) inc. STL's	Total (Ccf)
Clearwater Timber Prod.	48,800	54,850	74,000	6,083	6,910	190,643
Weyerhaeuser	64,800	33,532		29,167	20,732	148,231
Canyon Cr. S/M	5,393					5,393
Total	118,993	88,382	74,000	35,250	27,642	344,267

Table # 2 Northern Supply Block

1 Industrial Capacity (Ccf)	2 Approximate A.A.C. (Ccf)	3 Approximate Operable AAC (Ccf)	4 1975 – 1977 Ccf
354,458 – F.S. 423,053 – Company	407,400	359,919	268,303 27,642 (STL's) 295,945

Using 75 – 77 cut As Demand		Using Industrial Capacity As Demand			
		Company		F.S.	
2–1	3–1	2–1	3–1	2–1	3–1
111,455	63,974	15,653	63,134	52,942	5,461
SURPLUS	SURPLUS	DEFICIT	DEFICIT	SURPLUS	SURPLUS

Southern portion of T.S.A. has worst deficit

Table # 3 Northern Supply Block

Crown Committment	281,375 Ccf
Approximate Operable AAC	359,919 Ccf
Surplus	78,544 Ccf

Note:

1. These figures are the first phase of Timber Supply Analisis. Detailed data will not be collected for this Timber Supply Area until September 1979.

2. Deficit and surplus figures vary considerably depending on figures used for demand ie: 1) 1975 – 1977 cut
   2) industrial capacity
   3) existing crown committment

Lower bound demand figure will most likely consist of a modified existing crown committment figure. As noted in tables, we have deficit using lower bound figure and any further reduction would increase the deficit. (Note: No allowance was made for caribou in tables). A rough estimate of the effect Fish & Wildlife requests will have on the Allowable Annual Cuts of the Raft and North Thompson P.S.Y.U.'s are as follows:

Raft - 7.5 % reduction
North Thompson - 13 % reduction

Questions and Comments

Ray Travers, ELUC Secretariat: This preliminary analysis indicates a large deficit over present commitments. How will this be accommodated?

Ralph Johnston, Ministry of Forests, Kamloops: At this stage we don't know.

Mike Wilkins, Ministry of Forests, Kamloops: Perhaps I can clarify the reference to long and short term annual allowable cut calculations. There will be two calculations, one over 20 years (short term) and one over 2 rotations (long term). We may well be able to maintain the present A.A.C. for the forseeable future if no substantial deficit is indicated in the long term calculation.

Steve Tolnai, Weyerhaeuser Canada: Regarding intensive management, couldn't there be a conflict between this and the present selection cuttings?

Mel Monteith: I don't see a conflict because I consider thinning and selection cutting to be part of an intensive management regime. In any case, many of the other intensive management techniques will be limited to high capability sites elsewhere than the subalpine.

Rod Willis, Weyerhaeuser, Vavenby: I don't believe that this will necessarily be the case. Medium sites may show a greater return from intensive management than high sites because you may not be able to do much to improve a high site.

Mike Wilkins, Ministry of Forests, Kamloops: I can't agree. The highest priority programme is likely to be tree improvement and the resultant stock will almost certainly be planted on the highest possible sites where growth rates will insure the best return.

10. Fish and Wildlife Management Policy - Caribou

(Wally Macgregor, i/c Ungulate Management, Fish and Wildlife Branch, Victoria)

In January of this year a Proposed Wildlife Management Plan for British Columbia was released for public review and comment. Several meetings have been held to review public comments and more are scheduled.

The Plan as distributed contained a questionnaire and a request for written suggestions for improvement of the plan and the policies and objectives it contains.

Provincial and Regional Wildlife species plans have been or are being prepared.

In the proposed provincial plan, there were species statements for each big game species. These species statements contain a general description, objectives, policy, management prescriptions and a list of problems.

For our purposes we used the following definitions:

Policy: A statement that describes the framework within which management prescriptions (courses of action) are developed to meet objectives.

Management Prescription: A statement that outlines action required to achieve objectives.

Our plans were developed under the philosophy that:

1. No native species should be extirpated (made extinct in B.C.) through the actions of man.
2. Wildlife should be enjoyed and used by man in a manner which ensures the maintenance of wildlife or future generations.
3. Management effort should be responsive to public demand for wildlife use and should encourage and accommodate the widest range of uses possible.
4. Game species should be managed on a sustained yield basis giving consideration to all users, with emphasis on the quality of the recreational experience.

In the plan the two principal goals are identified:

1. To maintain the diversity of species representative of the major biophysical zones of the province, and

2. To ensure that, within the constraints of land capability and biological limits of each species, wildlife is available in sufficient abundance to meet the recreational and economic needs of society.

All the wildlife management objectives and policies described in the provincial plan are directed toward achieving these goals.

The caribou species statement in this plan was generally as follows:

Caribou (Rangifer tarandus caribou)

Caribou are the only members of the deer family where both sexes normally have antlers. They are particularly adapted to travelling over soft ground or snow.

Lichens are an important winter food item for caribou.

The Dawson caribou (Rangifer tarandus dawsoni) formally was found on Graham Island in the Queen Charlotte Islands. This caribou has probably been extinct since the 1930's.

The woodland caribou are found in the boreal forest areas of Canada from the Atlantic to the Pacific. In addition the Selkirk herd some times winters in the U.S. along the Washington, Idaho border.

Formerly the woodland caribou were classified as several species and subspecies. The revision of the status of caribou in 1961 combined what had formerly been considered two separate subspecies Mountain Caribou (Rangifer tarandus montanus) and the Osborn Caribou (Rangifer t. osborni) into a single subspecies (R.t. caribou).

Female caribou do not usually breed until they are at least 2½ years old. Single calves are normally produced. This is a low reproductive rate compared to other members of the deer family.

The caribou population within B.C. is estimated at between 10,000 to 20,000 animals.

Objectives

1. Increase the cariobu population to at least 20,000 animals.

2. Provide an opportunity for people to view caribou in their natural habitat.

3. Provide 20,000 sport-hunting days of recreation and an annual sustained hunter kill of 1,000 animals.

Policy

Caribou will be managed on a herd basis such as (Selkirk, Monashee, Raft-N. Thompson, Tweedsmuir) primarily as a game specis. Emphasis will be placed on management for trophy bulls. Harvests will, therefore, be conservative and the rate will generally be below 6% of the fall population. Some herds (Selkirk, Murtle Lake) will be managed primarily for non-hunting uses - viewing and photography.

Management Prescriptions

1. Identify and protect critical caribou habitat. This consists of alpine tundra areas with ground lichens or mature forest with both arboreal and ground lichens. Human alteration of traditional calving areas, rutting grounds, and migration routes may seriously reduce caribou populations.

2. Identify caribou habitat and provide guidelines for developments which might otherwise destroy it.

3. Develop regional management plans for each caribou herd.

4. Designate and manage certain accessible populations primarily for observation.

5. Reduce harvest levels below recruitment on those herds or populations which have room for expansion.

6. Reintroduce caribou into portions of their former range which appear to have capability of supporting a population.

Within the framework of the provincial species plans Regional species plans have or will be prepared. We hope that these plans will help in interagency planning for resource management for the benefit of the citizens of the Province.

Comments and Questions

Mike Wilkins, Ministry of Forests, Kamloops: What is the reliability of your inventory?

Wally MacGregor: This varies greatly. In the southern portion of the province we are pretty well off for inventory information. In the more remote areas of the north figures are not very reliable. The best present estimate of provincial population is 15,000 ± 5,000 animals.

Ray Travers, ELUC Secretariat: What is the best means of dealing with the poaching problem?

Wally MacGregor: Basically three measures; more enforcement staff, special closures and better access management.

Ralph Ritcey: It must be stressed, however, that at the present time, poaching is less of a problem than habitat loss.

Ken Sumanik, Fish and Wildlife Branch, Nelson: In the Kootenays, as public awareness of the plight of the caribou has increased, the amount of illegal hunting has dropped significantly. I am sure the same thing will happen here.

Connie Crowley, Okanagan College: Bob Weinard was mentioning that snowmobiles are a problem in the Prince George area. Are they here too?

Ralph Ritcey: Only in a few localized areas.

Gordon Prest, Ministry of Forests, Blue River: Helicopter skiing is now well established in the Thompson and Raft. Is this likely to be a problem for caribou?

Ted Antifeau, Fish and Wildlife Branch, Kamloops: This is very hard to monitor, but in my judgement it's probably less of a problem than snowmobiles.

Steve Tolnai, Weyerhaeuser Canada: Is Fish and Wildlife Branch prepared to undertake benefit/cost analysis on the management of specific herds?

Wally MacGregor: Yes. This is one of the aims of herd-based management planning.

Wednesday, May 16th

1. Logging Operator's Timber Requirements (Steve Tolnai, Weyerhaeuser Canada, Kamloops)

My presentation will deal with three specific aspects of this obvious conflict situation; namely,

(1) Industrial wood demand on the area.

(2) Potential volume and value losses calculated on the basis of a Caribou reserve proposal made by the Fish and Wildlife Branch (letter of October 14, 1977 signed by G. E. Stringer).

(3) Forest Resource Management options.

Perhaps a little history at least covering my involvement with the Avola Mountain Caribou habitat area would be in order.

My involvement started in March 1973 when I joined Weyerhaeuser Canada Ltd. as Project Forester. One of the first projects given to me dealt with the conflict with the Fish and Wildlife Branch. We never had any conflict with the Caribou.

By August 1973 we had made contact or had had meetings with Dr. E. McEwan, Department of Zoology, U.B.C.; Mr. D. J. Freddy, then with Wilderness Research Center, University of Idaho; Dr. Don Guthrie; Dr. Richard Revel; and Dr. George Scotter of Envirocon Limited. These specialists or experts in some aspect of Caribou and Caribou habitat management convinced us that there must be a well-organized short- and long-term study carried out in the area in order to overcome the obvious impasse reached by all involved. It also became obvious that a lot of the statements made by all participants in the Conflict were nothing but emotional outbursts.

By October 1973 we had a Study Proposal made (entitled "Caribou/Logging Study") by Envirocon Limited. The intent was to have this Study carried out by this independent agency, jointly sponsored by the three operating companies (Balco Industries, Clearwater Timber, and Weyerhaeuser), the Fish and Wildlife Branch and the B.C. Forest Service. The project never got off the ground, mainly because of the lack of any agreement between the parties involved regarding the need for, objectives and the use of the findings of the Study.

The three companies paid the bill of $3,748.66 to Envirocon Limited for their services together with the bills for the helicopter, etc. and all of us returned to our individual desks, pick-ups, trees, caribou and to our individual bias, ideas and arguments. I believe that each of us learned something about the other "concern's" business hence we all improved our skills in consequent arguments.

I do not wish to bore you with a listing of numerous meetings, discussions, so-called agreements and decisions that occurred between November 1973 and the present day. However, I wish to bring to your attention a letter from the Fish and Wildlife Branch to the District Forester (dated October 14, 1977). This is an important document for two reasons:

1. Perhaps this letter played a greater role in us being together today than any other previous "happening".
2. The requirements set forth in this letter by the Fish and Wildlife Branch are used as the basis of my economic analysis.

(1) Industrial Wood Demand in the Study Area

The total Crown land area in the two North Thompson and Raft P.S.Y.U.s is approximately 1,541,000 acres. Sixty-three percent or 975,780 acres is productive forestland. A large protected area, the Wells Gray Provincial Park, covering approximately the same area as the two P.S.Y.U.s is situated tothe north and west of the Study Area.

There has been logging on the lower slopes of the Study Area for a long time. The economic and technical demand of the old primitive mills together with the then existing transportation and logging systems allowed only the highgrading of easily accessible areas. These were the lower slopes and the bottom lands of major drainages. A drastic change took place in both wood processing technology and logging systems in the early 1960's.

In order to be able to utilize new market opportunities (by-products) and technical innovations, all sawmilling and logging operations had to become "big". The area's wood growing potential became a target for utilization levels, hence the demand on the mature merchantable and economically available stands drastically increased. Major road developments at substantial costs followed and the high-grading (some still call it selective cutting) was replaced by clear-cut areas of economic size. The cut block started to creep up on the hillsides and reached up to the upper limits of merchantable stands. In short, both the level and the nature of demand changed.

According to Forest Service data, the Study Area can support an A.A.C. of approximately 275,000 Ccf. The current commitment to Industry is 212,970 Ccf or 77.4 percent of the calculated and approved A.A.C. The actual billed volume in 1978 was 246,771 Ccf or 115.8 percent of the committed volume.

I do not intend to dwell into the pros and cons of the calculated level of A.A.C. I am accepting it as the "best estimate" we have today.

We have superimposed some other statistics and estimates on the previous numbers. The five major industrial users account for 209,818 Ccf or 98.5 percent of the currently committed volume. As we all know (at least those who work in the Industry), each and everyone of these stationary users are short of wood based on their currently installed capacity. A conservative estimate of the deficiency shows that a 72,000 Ccf per year shortage, on a pro-rata basis, should come from the Study Area. Therefore, the true demand on the area would be:

212,970 Ccf (committed)
72,000 Ccf (deficiency between allocated and capacity)
284,970 Ccf

This is approximately 104 percent of the calculated A.A.C.

In short, there is no surplus or excess wood in the Study Area.

Current Economic Contribution by the Industry

In order to provide some perspective of values associated with the 1978 billed timber volume of 246,771 Ccf, the following statistics were developed:

Average Lumber Selling Price in 1978	$228.35/M fbm
Average By-Product Revenue in 1978	17.03/M fbm
	$245.36/M fbm

Average LRF = .650 M fbm/Ccf

Lumber and By-Product Value/Ccf = $159.50

Billed Volume in 1978 = 246,771 Ccf x $159.50 = $39,350,404.00 (mill gross)

Estimated Logging Area to Develop Billed Volume @ 45 Ccf/Acre = 5,484 Acres

Value Generated Per Acre Logged = $7,214.96

The distribution of the mill gross amount of $39,350,404.00 by some of the major recipients can be broken down as follows:

	Number Employed	$ Paid in 1978
Logging Contractors (@ $26.00/Ccf)	180	6,416,046
Hauling Contractos (@ $12.50/Ccf)	70	3,084,637
Road, Landing Constr. & Mtce. (@ $12.50/Ccf)	30	3,084,637
Planning, Supervision (Logging)(@ $4.50/Ccf)	28	1,110,469
Post-Logging Treat. & Reforest. (@ $2.50/Ccf)	15	616,927
Log Handling, Scaling, Merchand. (@ $4.10/Ccf)	20	1,011,761
Sawmill Labour (@ $28.60/Ccf)	500	7,057,650
Sawmill Supply (@ $10.00/Ccf)	5	2,467,710
General Overhead & Admin. (@ $6.50/Ccf)	58	1,604,011
Insurance, Taxes (Property), Depreciation (@ $9.50/Ccf)		2,344,324
Rentals, Leases, Licences, Fees (@ $1.10/Ccf)		271,448
Stumpage & Royalty (@ $8.50/Ccf)		2,097,553
	906	31,167,173

Mill Net = $39,350,404
Less 31,167,173
= $ 8,183,231

The direct tax return to all levels of government can be roughly calculated as follows:

Personal Income Tax @ $25% of $18,120,000	$ 4,530,000
Municipal, Provincial and Local Taxes (school)	592,400
Licences, Fees, Land Tax (Provincial)	271,448
Sales taxes on fuel, equipment & supply	480,000
Corporate Income Tax (46%)	3,764,286
Stumpage	2,097,553
	$11,735,687

There are many other tax items not considered. I just wish to refer you to a Pacific Forest Research Centre publication entitled, "Estimates of Taxes, Fees and Royalties Paid by the B.C. Forest Industry and Employees: 1971-1975".

All and all, approximately $11,735,687.00+ or 30+ percent of the generated value finds its way back to the coffers of different governments. At the same time, 906 direct logging and forestry jobs depend on the Industry. With a multiplier factor of 1.5, an additional 1,360 indirect jobs are generated in the area.

In other terms, approximately each 272 Ccf of sustained annual cut assures a permanent job in the bush or in the sawmill (8 months in logging and forestry; 12 months in sawmill and administration) plus another one and a half jobs in the supply and service industry.

(2) Potential Volume and Value Losses Based on Fish and Wildlife Proposal of October 14, 1977

I must stress that the following calculations are based on estimates, although I like to think that they are defendable in every respect.

The Fish and Wildlife Branch proposal calls for:

- preservation of approximately 10% of good growing sites
- preservation of 50% of medium growing sites
- preservation of 100% of poor growing sites

It is estimated that the proposed "Caribou Reserve" contains approximately 153,000 acres of productive forestland. By site class the preserve would be:

Good Site	Medium Site	Poor Site	All Sites
10%	50%	100%	
Distribution of area by site:			
5%	35%	60%	
The area of preserve within the Caribou Reserve:			
765 ac.	26,775 ac.	91,800 ac.	119,340 ac.
MAI (net) by sites (per year):			
50 cu.ft.	35 cu.ft.	21 cu.ft.	
Annual growth on the total preserve:			
385 Ccf	9,371 Ccf	19,278 Ccf	29,031 Ccf
Standing mature merchantable volume assuming the following maturity and merchantability distribution:			
80%	75%	70%	= 84,952 ac.
With following volume/acre:			
65 Ccf	45 Ccf	35 Ccf	
Mature volumes are:			
19,864 Ccf	903,656 Ccf	2,249,100 Ccf	= 3,172,620 Ccf

Calculation of Product Values

Merchantable value x average lumber and by-product value = Potential value of merchantable timber

3,172,620 x $159.50 = $506,032,890.00 or approximately $5,956 on each of the reserved 84,952 acres of mature forest

Or if one considers only the loss of the annual allowable cut associated with the 119,340 acres of reserved area, the calculation indicates a yearly value loss of $4,630,444 for an indefinite period. This A.A.C. loss represents 107 jobs directly and another 160 jobs indirectly in the Region.

(3) Forest Resource Management Option

First of all, I would like to dispel a myth associated with the word multiple use. I suggest that declaring an area a multiple-use area does not do much more towards the solution of use conflicts within that area than telling a patient with a ruptured appendix that he will get better. Most likely he will get better if a number of things are done to him, including major surgery.

I prefer the use of Integrated Use Management. Integrated use does not imply that it is "all for all at all times".

We must accept the concept of Primary Resource Use within the framework of Integrated Use. I hope this approach does not scare anyone. It should not. This concept simply reflects real life. The use of an area by fisherman, berry-pickers, loggers, hikers, etc. co-exists very well in most cases. This is due to the seasonal separation of use, hence each use becomes a primary use at a given time. I suggest that all hell would break loose if all these people would want to use the same area at the same time. In my example, a real conflict would (and sometimes does) develop when a picnicker, berry-picker or hunter insists on using a landing for parking his vehicle that is used for its purpose of log manufacture, storage and loading. Luckily very few argue about the primary purpose of a landing during logging season between the hours of 5:00 a.m. and 7:00 p.m. It is still available for "others" between the hours of 7:00 p.m. and 5:00 a.m.

Why did I dwell so long on this subject? Because I believe that there is a way for making room for all other non-human users of the same area as well. The primary use of a portion of the Study Area at a given time by Caribou is probably a real thing and should be endorsed, and other uses curtailed or restricted at that specific time.

I do not prescribe to the exclusive or single use of any timber-producing area by the Caribou, the hunter, hiker, or the logger. There is no need for it from the standpoint of the Caribou since there is a large area adjacent to the Study Area that is dedicated for the exclusive use of Caribou and other wildlife species. The lock-up of any additional area would be a tremendous financial and economic loss to the Region, seemingly without any justification.

Yes, I would be prepared to commit millions and millions of dollars to the preservation and hopefully to the population growth of the last herd of Caribou or any other wildlife species, but I doubt it very much that this is the case with our friend in the North Thompson drainage.

I do not think that we should, nor do we intend to, wipe this species out in an area just because there is a lot of them somewhere else. But at the same time we must realistically assess how much are the 30-50-100-300 Caribou worth frequenting the Study Area. Perhaps we cannot put a dollar value on the head of the Caribou or any other creature of this nature, but we can put a dollar figure on other resources before we decide to forget them and dedicate the area to other than consumptive, revenue and job creating uses, together with sometimes primary, other times secondary use by the Caribou also.

Information that I have indicates that there has been an increase in the number of Caribou frequenting the area. This increase occurred in spite of herd hunter pressure. Mr. Baxter and Mr. Jeans have firsthand information on this. They can tell us about it so all of us get a bit better informed about some specifics regarding the Caribou in the Study Area.

I called this section "Forest Resource Management Options". As you can see from my monologue, I think there is only one option. Namely to dedicate the area to a truly Integrated Resource Use through the Primary Resource Use Concept.

Dependency on High Elevation Wood

I do not have exact figures available but approximately 50 percent of the merchantable wood harvested in the Study Area originates from 5,000'+ elevation. This is not necessarily by choice or by design.

Commercial, mainly Spruce and Fir, timber stands at lower elevations have been cut many years ago. Extensive areas are covered by immature stands that will not be available for harvest for at least 20 to 50 years. This is especially the case with the Raft P.S.Y.U.

There are some large blocks of decadent overmature Hemlock-Cedar stands but unfortunately they do not offer an alternative. With the exception of a few small Cedar patches, these stands cannot support the cost involved with the extraction of their merchantable component.

Portions of the steep hillside contain pockets of good quality Spruce, Fir and White Pine but the cost of roads to develop them cannot be justified. Also there is problems with logging these areas since all conventional logging systems are being discouraged on environmental grounds.

And it might come to you as a surprise that there just aren't any large undeveloped drainages available to move into as alternatives.

We agree that the value of these high elevation Spruce-Balsam stands is not as high as a prime Spruce stand on lower elevations and only a few miles from the manufacturing facility. Nevertheless experience indicates that during good market conditions they offer a fair profit opportunity while under poor market conditions they still offer a marginal existence.

To sum it up - we need these high elevation areas because there isn't anything else to log in order to keep our facilities going. Furthermore, all stands contribute to the calculated and needed allowable cut. Any reduction in the forestland base would mean a corresponding reduction in A.A.C. This, in turn, would mean the phasing out of some existing processing facilities.

STATISTICS RELATED TO THE STUDY AREA

(Extracted from presentation by I. S. Tolnai, "Logging Operators' Timber Requirements and Viewpoint")

(1) A.A.C., Industrial Need and Utilization

Approx. A.A.C. of Area	275,000 Ccf
Committed to Industry	219,970
1978 Harvest	246,771
Allocation to 4 Major Users	209,818 Ccf
Wood Shortage (Pro-rated)	72,000
Committed to Minor Users	3,152
Total "Need"	284,970 Ccf

(2) Economic Contribution

1978 Av. Lumber & By-Product Value = $245.36/M fbm
Av. Lumber Per Ccf = .650 M fbm
1978 Av. Lumber & By-Product Value = $159.50/Ccf

Value Generated in 1978 = $39,350,404.00

Approx. Acres Logged in 1978 = 5,484 acres
Av. Volume Per Acre = 45 Ccf

Value Generated Per Acre = $7,214.96

(3) Number of People Employed and the Distribution of Generated Value

	No. of People Employed	$ Paid to in 1978	% of Total
Logging Contractors	180	$ 6,416,046	16.3%
Hauling Contractors	70	3,084,637	7.8%
Road & Ldg. Constr. & Mtce.	30	3,084,637	7.8%
Planning, Supr. (Logging)	28	1,110,469	2.8%
Post-Logging Treatment & Reforestation	15	616,927	1.6%
Log Handling, Scaling, Merchandising	20	1,011,761	2.6%
Sawmill Labour	500	7,057,650	17.9%
Sawmill Supply	5	2,467,710	6.3%
General Overhead & Administration	58	1,604,011	4.1%
Insurance, Taxes (Property), Deprec.		2,344,324	6.0%
Rentals, Leases, Licence Fees		271,448	.7%
Stumpage & Royalty		2,097,553	5.3%
	906	$31,167,173	79.2%
Mill Net		$ 8,183,231	20.8%
			100.0%

(4) Tax Component of the Generated Value (Direct Taxes)

Personal Income Tax (Based on Wages)	$ 4,530,000
Provincial Local Taxes (by Companies)	592,400
Licences, Fees, Land Tax	271,448
Sales Taxes on Fuel, Equipment & Supply (by Companies)	480,000
Corporate Income Tax	3,764,286
Stumpage and Royalty	2,097,553
	$11,735,687

(5) Job Creating Potential

Total Direct Employment = 906 jobs
Indirect Related Employment = 1,360 jobs
A.A.C. Supporting a Permanent Job = 272 Ccf/Year

Questions and Comments

Ken Sumanik, Fish and Wildlife Branch, Nelson: It is encouraging to see an industrial forester so concerned with the preservation of productive forest land. We certainly could have used your voice, and those of your compatriots, at the Revelstoke hearings where, as you know, B.C. Hydro was given permission to flood thousands of acres of some of the most productive forest land in the interior of the province. You have certainly been diligent in your opposition to reserves for caribou. Can we expect an equal amount of time and energy in opposition to the programmes of the Ministry of Lands, Parks and Housing who plan to consign even more productive forest lands to five-acre rural subdivisions and marginal agriculture?

Randy Chan, Balco Industries Ltd., Kamloops: My feelings are that caribou are on the increase in the North Thompson, and that logging and caribou are compatible. Harvesting so far has been concentrated in dense, overmature stands where timber removal probably increases lichen growth.

Ralph Ritcey, Fish and Wildlife Branch, Kamloops: Contrary to Randy's statement, all indications are that caribou have decreased in numbers, particularly in the Raft, and that this decrease is consistent with accelerated timber harvesting in the sub-alpine. There may be more sightings of animals, but this is probably due to the proliferation of access throughout the caribou's range.

Susan Stevenson, Prince George: Regarding Mr. Chan's comment that logging has improved habitat, it is possible to theorize that carefully planned selection logging would enhance lichen growth; however, this has not yet been proved. There has to be a substantial number of older trees left for lichens to grow on or the result cannot be anything but adverse.

Randy Chan: Couldn't patch clear-cutting be considered just an extension of selective cutting on a larger scale?

Susan Stevenson: But it is that larger scale that probably off-sets any enhancement of lichen growth.

Mel Monteith, Ministry of Forests, Clearwater: In the past the Forest Service was not allowed to fight fires in Wells Gray Park. One fire (Steve's Fire?) destroyed 5,000 acres of caribou range. We must manage habitat inside the park as well as outside or we may well lose the caribou totally.

Bob Weinard, Northwood Pulp Ltd., Prince George: One reason that we're studying caribou is to determine the proper timing for the second pass. When is the second pass contemplated for the North Thompson Raft and what is the rotation age?

Rod Willis, Weyerhaeuser, Vavenby: The new Forest Act makes provision for a 15 year harvesting licence. Accordingly, we have just completed a 15 year plan. By the end of the plan we will have developed every major drainage of the Raft/North Thompson. Sometime in the following 15 years (i.e. 15-30 years from now) we will have no choice but to go back and take the leave strips. The basic problem is whether we are going to have caribou or employment. That's the bottom line.

Don Baxter, Clearwater Timber Ltd.: If major companies will have developed all major drainages in 15 years time, then smaller companies such as ourselves will be into leave blocks in 7-10 years.

Bob Weinard, Northwood Pulp, Prince George: We appear to be relatively lucky in Prince George not to have the degree of timber supply problem that Kamloops has. The problem, however, appears to be so widespread that one of the most pressing questions that we as foresters have to answer is how we're going to manage and protect our climax forest wildlife species.

Sandy MacDonald, Fish and Wildlife Branch, Kamloops: The shortfall indicated in the timber supply analysis is quite high. There must be a fair degree of overlap between EPA withdrawals for other reasons and the core caribou range so that the actual contribution of caribou to the shortfall has to be far lower than that calculated by Steve Tolnai. Is it a case of caribou being "the straw that broke the camel's back"?

Steve Tolnai, Weyerhaeuser Canada, Kamloops: There has been a continual erosion of the productive forest land base over the past few years due to pressure from many different sources. It is impossible to say that any particular reduction is more important than another because they are all additive.

John Dick, ELUC Secretariat: There should be some clarification of the term "erosion of the forest land base", particularly as it applies to the E.P.A. programme. Many areas being removed are sites that, for a number of reasons, should never have been included in a sustained yield calculation in the first place. What we are doing now is defining the forest land base not eroding it.

Rod Willis, Weyerhaeuser Canada, Vavenby: Ultimately this conflict has to be seen in social terms. We will have public problems whether we write-off caribou or forest production.

Carl Henning, Lignum Ltd., Williams Lake: I don't believe that is possible to arrive at a compromise when the conflict is timber production vs climax species. The only solution is "to thrash it out and winner take all".

Mike Williams, Ministry of Forests, Kamloops: How important is Wells Gray Park to maintenance of caribou in the area?

Ralph Ritcey: The park is very important. It contains 75% of the caribou in the North Thompson/Clearwater drainages. However, 30% of the park population also utilizes areas outside the park boundary and this is why the moratorium areas in the Raft/North Thompson PSYU's are important too.

Mike Wilkins: If the Raft were logged completely would the park population survive?

Ralph Ritcey: Probably not the whole population. A portion of the 30% that utilize areas outside of the park would probably die.

Mike Wilkins: If, in the end, this did happen, would it be such a bad thing if the survival of the remaining animals in the park was assured? How many animals do you need?

John Dick, ELUC Secretariat: As an applied biologist Mike, you should recognize the importance of gene pool preservation, particularly for species that tend to congregate in more or less isolated herds. In terms of species maintenance it is genetically healthier to have a number of smaller herds than one large one.

2. Logging Operability (Ray Travers, ELUC Secretariat, Victoria)

I want to make some comments on the overall analysis, of which logging operability is a part. I will not however say much about operability directly as it is clear the ideas incorporated into the operability concept have been generally accepted and for that I am very pleased.

My first comments are directed towards the definition of what we mean by the terms management and planning. I detect considerable ambiguity on this, and every time I hear the term "management plan" I detect a degree of confusion of what it is we are actually trying to do.

I define planning, as well as management, as follows:

Planning (Passive)

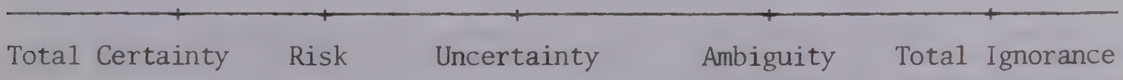
Setting objectives (What it it we want to do?)
Identifying constraints (What is it that is preventing achievement of the objectives?)
Identifying criteria for success (How do we evaluate our progress?)

Management (Active)

Weighing the Benefits and Costs (Asking the question - Is it worth it?)
Weighing the Risks (Are the risks acceptable?)
Making the Decision.

Whether or not this process works will depend on the degree of information available. We will never have perfect information, so we must live with imperfect knowledge.

I like to think of this reality in the context of a spectrum of knowledge:



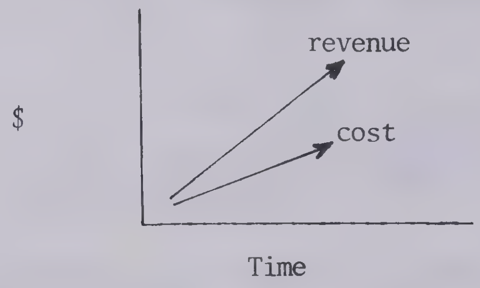
Spectrum of Knowledge

Total ignorance on issues is where many of us begin. Ambiguity is the point where we know just enough to be confused. Uncertainty is the place where we understand the relationships, but realize how much we don't know. Risk is the place where probabilities can be identified. Total certainty is not within our reach.

As an example of how this concept was implemented, is the operability idea. Operability, as stated in the concept, first requires an assumption.

This assumption is:

Long run revenue-cost relationships will remain stable, relative to one another.



In others, inflation will occur, but the revenue-cost margin will remain. This leads to the primary relationship.

$$\% \text{ Profits} = \frac{\text{Revenue - Cost}}{\text{Costs}} \times 100\%$$

The major principles are:

1) It is the width of the revenue-cost margin that defines the degree of uncertainty and risk.

2) Revenues are primarily related to the degree of quality control (in this instance felling practices - etc., to ensure inherent quality winds up on the output end of a mill).

3) Costs are related primarily to the degree of uniformity in the operating conditions - that is, in uniform conditions it is easy to design a system that fits, and works well at minimum cost.

Therefore the forest terrain can be separated into operability classes.

Operability I - Always profitable
Operability II - Profitable only at high markets
Operability III - Never profitable, as long as conditions in the future remain anything like the present.

Accordingly, low and extreme risk logging can be defined.

Low Risk Logging (High Revenues - Low Cost)	Extreme Risk Logging (Low Revenues - High Cost)
- uniform timber	- variable timber
- uniform terrain	- broken terrain
- high quality, low defect	- low quality, high defect
- long operating season	- short operating season

Functions related directly to timber, affected by the above, such as yarding, hauling, etc. account for about 60% of the costs. Roads and overhead account for about 30% and 10% respectively.

With respect to the problem we are dealing with here today concerning the relationships between timber and caribou, the way I think we should proceed should be on the basis of determining the actual degree of conflict. We have heard from many well qualified people what the relationships are. We must now structure our analysis on the basis of what has been identified. I suggest the following table could be very useful:

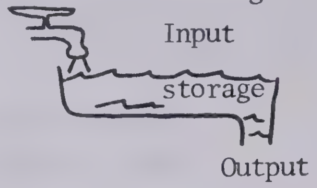
	State of Nature		
Assumptions	Desirable	Marginal	Undesirable
Optimistic	E.G. Op I	II	III
Neutral			
Pessimistic			

In this way we could take our information and see what the actual overlap is, for caribou and timber.

I think it would be further useful if we viewed resource management from what has been identified as a systems perspective.

The fundamental idea here is that any system operates in the fashion according to what Kenneth Boulding called the Bathtub Theorem.

$$\text{Input Rate} = \text{Storage Rate} + \text{Output Rate}$$



Storage is a very important component for it enables the system to cope with uncertainty. Present resource management concepts ignore this important consideration.

In Wildlife the common perspective is to think in terms of recruitment (the annual increase or decrease in the number of animals.

$$\text{Recruitment} = \text{Natality} - \text{Natural Mortality} - \text{Hunting}$$

In forestry the model is

$$\text{Allowable Annual Cut} = \frac{\text{Volume of Mature Timber}}{\text{Rotation Age}} + \text{Growth Rated Immature Timber}$$

Both these models do not adequately account for uncertainty. I suggest we should take the systems perspective, and for the production period for wildlife:

Natality = Breeding Stock + Mortality + Hunting; and for timber:

Growth = Mature Timber + Harvest

This would ensure continuous long run production.

Finally, we must sharpen our evaluative tools. I think, following the analysis, the following questions should be asked:

(1) What are the physical and biological consequences of actions?

(2) Is the action efficient? In other words, do the outputs exceed the inputs?

$$\text{Efficiency} = \frac{\text{Quantity of Outputs}}{\text{Quantity of Inputs}}$$

If the ratio is 1.0 or greater, then it is efficient.

(3) Is the action equitable? Is there a fair sharing of the costs and benefits?

(4) Is the action socially acceptable?

(5) Will the action be administratively and operationally practical?

In summary, I would like to state that the discussion has indicated some flexibility for meeting both the needs of the forest and wildlife resources. We must explore those possibilities to see how much that flexibility contributes to solving the overall problem.

3. Information Sythesis: Clarifying the Options

(a) Alternatives for Forest Management (Mike Wilkins, Acting Assistant Regional Manager, Ministry of Forests, Kamloops)

It was my understanding that synthesis, at least as I define the word, was not the intent of this meeting. Rather, the main objective was information exchange and, from this point of view, I feel that the workshop has been very valuable.

To reiterate a point I made in the introduction, the Ministry of Forests has a mandate to manage only on an integrated basis. It cannot accept any large scale withdrawals from the forest land base that would seriously constrain timber allocation, as would be the case with the 118,000 acre caribou moratorium proposal.

The Ministry is, however, prepared to modify cutting plans to protect caribou habitat. We have already undertaken selection cutting where this is silviculturally acceptable, and we are prepared to consider deferments of critical habitat for up to 30 years. With reference to earlier comments by Rod Willis and Don Baxter to the effect that they may be forced into a second pass in seven years for smaller companies and 15+ years for larger companies; if this is true, then we are in a far tougher spot regarding timber supply than I thought possible. I must stress that we are prepared to consider deferments only on proven critical habitat. It is up to the Fish and Wildlife Branch to define that habitat.

The Timber Supply Analysis allows us to establish through the computer an unlimited number of management scenarios. The annual allowable cut, both short and long term, can then be determined for all of these options. We should select 3 options lying between the two obvious extremes and determine the impact of each. The Ministry of Forests would then be responsible for adopting the option that is most acceptable to the Forest Service, the Fish and Wildlife Branch, the Forest Industry and the public.

(b) Alternatives for Wildlife Management (Ralph Ritcey, Regional Wildlife Biologist, Kamloops)

In my view the main value of this workshop has been educational. In a sense we have been able to look at what we have learned and the attitudes that have developed as a base to build on.

The Fish and Wildlife Branch is not in as strong a position, in terms of carrying out its responsibilities, as the Ministry of Forests because we do not have control of the land base. This will not constrain us, however, from pointing out the implications for wildlife of forest management practices. In determining a course of action it would seem wise, given the current state of our knowledge, to keep as many options open as possible. For example, if we reserve an area of forest for caribou, that decision is entirely reversible as new information and/or new social needs arise. If we log all of the critical caribou habitat, that decision cannot be undone in our lifetime and, perhaps, not even in that of our children. In reference to the discussion on the erosion of the forest land base, I can only say that caribou do not erode the productive forest land base, skidders do!

Mike Wilkins has stated that the Ministry of Forests will consider deferments only on "proven" habitat. We have delineated critical caribou habitat to the best of our ability given our current state of knowledge. If this is not acceptable to the Ministry of Forests, then they should define what level of information they would consider adequate. We would then have to seek the funds to carry out the studies necessary to refine our knowledge to that level.

4. Future Action (Peter Walton, ELUC Secretariat)

A few comments on where I see the study going from here would seem appropriate. First, before I begin, I would like to note that it was stated previously that one reason for ELUC Secretariat involvement in this logging/caribou study is to ensure that the issue receives a full airing and all viewpoints receive a fair hearing. I feel that the Workshop has certainly been a success in this respect.

Secondly, I feel that the momentum which this Workshop has generated should be sustained. This will require us in the Secretariat to go back to Victoria, think through the Workshop and the information regarding the logging - caribou problem that has come out of it and return to Kamloops, hopefully by the end of June, to sit down with Forest Service and Fish and Wildlife Branch and begin a thorough analysis of the issue.

I see the planning program that we might follow as having five steps:

i. A clear articulation of the conflict:

- there is a need for a more precise problem statement
- there is a need to identify the extent to which "competing" demands on the resource base can be accommodated
- perhaps I am being optimistic, but there may be more flexibility here than originally thought
- both Steve Tolnai and Don Baxter have pointed out that areas of caribou habitat exist which their companies do not foresee ever logging
- this situation can, of course, change but it is an encouraging sign.

ii. Consolidate existing information:

- to mention but a few sources of information, there is
    - Fish and Wildlife Branch's inventory of the caribou resource
    - Ministry of Forests' Timber Supply Area (TSA) analysis
    - Fish and Wildlife Branch's management objectives, both general and species specific
    - Ministry of Forests' overriding objectives of the TSA analysis
    - the requirements of private industry for the timber resource

  - the demands of the public (whether rod and gun clubs or naturalist groups) on the caribou and forest resource.

iii. Analyse the data:

- it is necessary to critically evaluate this information
- we must make explicit those assumptions that are built in to any information, calculation, projection, etc. that we deal with.

iv. Outline management options that emerge:

- here it may be necessary to be conservative in our approach
- the emphasis is on "planning for uncertainty" and it is important to preserve future management options
- we must make our best judgement on the basis of existing information but not preclude the possibility of adapting a plan or approach to suit changing conditions and demands, whether at the agency level, in the private sector, or in society as a whole.

v. Consultation:

- it is essential to ensure consultation with private industry (the logging operators) and the general public in addition to the affected government agencies
- public involvement is part of the mandate of the ELUC Secretariat
- it is also the position of the Minister that public input be sought
- it is to be hoped that we can reach agreement at the regional level on an interim or more long-term resolution of the problem
- if this is not possible, we have the Environment and Land Use Technical Committee and the Environment and Land Use Committee of Cabinet open to us for resolution of policy conflicts

5. Final Comments from Participants

Ray Travers, ELUC Secretariat: Before we go too much further in this exercise, I believe that we are going to have to come to grips with some definitions such as carrying capacity, the time and space relationships as they affect rotation age, and distinction between fact (objective) and value (subjective). We should try to keep the resolution of this conflict in the objective arena but in order to do this we will have to pay more attention to the inter-relationships involved and avoid single parameter thinking.

Marty Beets, Habitat Protection Biologist, Williams Lake: I think it's about time that we started to ask some questions about the real roots of the problem. Throughout this workshop the Forest Service has been sitting back watching the dogfight between the Fish and Wildlife Branch and the Forest Industry. The Forest Service managed us into the present dilemma, what are they going to do to get us out of it?

Mike Wilkins, Ministry of Forests, Kamloops: The problem of an over-committed level of harvest exists. What makes it even more serious is that we have built a regional industry predicated on that level of cutting. It is too early to argue, however, that the A.A.C. is too high in the long term since this is what the timber supply analysis is set up to tell us. If it is too high, the Forest Service can not be blamed in isolation because the level of resource exploitation that we've had over the past 2-3 decades was in large part demanded by society.

John Dick, ELUC Secretariat: Alas, this seems to be the day of the instant expert and nowhere is this more apparent than in the field of wildlife management. As a biologist I find that other professionals insist on making judgements on my discipline that I would not presume to make on theirs. It seems that one common reaction of people faced with an unpleasant choice is to attempt to discredit the other person's data. We have seen examples of this gambit in the professed disbelief that caribou are declining and that certain areas are critical habitat. Let's recognize these for what they are - rather transparent attempts to avoid coming to grips with the problem. If we are going to find a solution to the present conflict, then we are going to have to start working together as professionals, accepting one another's best judgements, and attempting to formulate our management prescriptions in such a way as to allow other managers as much freedom of action as possible.

Sandy MacDonald, Habitat Protection Biologist, Kamloops: We also have to recognize that this logging/caribou problem is much broader in scope than the North Thompson/Raft P.S.Y.U.'s. It is common to much of the Southern Interior. Any solution that we arrive at must be applicable in the Kootenays, Prince George, the Cariboo and elsewhere.

Ken Sumanik, Fish and Wildlife Branch, Nelson: American processes and experiences may give us a good picture of things to come. Environmental impact statements are now required for major management initiatives and technical staff are answerable in the courts. The U.S. Bureau of Land Management is currently facing a $52 million class action lawsuit for mismanagement brought by a number of user groups. The same thing could happen here.

Grant Hazelwood, Parks Branch, Victoria: I was very impressed with the presentations on selection cutting. It seems to me that this will be a very valuable technique in achieving a solution to this conflict.

6. Radio-Tracking Mountain Caribou in the North Thompson River Watershed

(E.D. Antifeau, Fish and Wildlife Branch, Kamloops)

Objectives:

To determine seasonal movements and habitat selection of mountain caribou in the North Thompson River watershed, British Columbia.

Introduction:

The activities of man are increasingly modifying natural environments, endangering the survival of organisms dependent upon undisturbed, climax ecosystems. The mountain caribou of the North Thompson River watershed are a member of the climax biota of this area. This population has been steadily declining for at least the last decade (Ritcey, 1970, 1974, 1977, 1979; Ritcey and Low, 1975). Concurrently, the caribou winter range has steadily and substantially decreased in area due to wildfire, escaping slash fires, and human development activities, particularly clearcutting and road building (Ritcey, 1974).

The effects of habitat destruction and other disturbances, such as increased access leading to harassment or legal and illegal overharvests, upon this population could be serious. Effective management to maintain the indigenous North Thompson caribou population requires refining our general knowledge of their biology, seasonal movements and habitat requirements.

Study Area:

The study area is in the North Thompson River watershed, primarily within the Raft and North Thompson P.S.Y.U.'s, but also including important caribou habitat in areas of Wells Gray Provincial Park immediately adjacent to these two P.S.Y.U.'s.

The major biogeoclimatic zones (Krajina, 1965) here are the Engelmann Spruce-Subalpine Fir from roughly mid-slope to the forest alpine transition at about 1830-2130 metres, with the Interior Western Hemlock and, to a lesser extent, the Interior Douglas Fir Zones at lower elevations.

Methods:

Caribou were chemically immobilized and instrumented with radio transmitter collars between August 1978 and April 1979. A "Cap-Chur" dart gun delivered syringe-darts containing an immobilizing drug. Capture techniques included: stalking and immobilizing from the ground; darting from a hovering helicopter; and using a helicopter to herd caribou within range of a dart gunner on the ground. The latter tehcnique was the most successful and efficient, particularly in late winter when caribou frequented timberline areas.

Instrumented caribou were tracked from the ground with a portable hand-held receiver and antenna or from a pick-up truck equipped with a high gain antenna. Fixed-wing aircraft equipped with a wing-mounted antenna were also used for tracking during the late winter period.

Locations of instrumented caribou and others observed were plotted on 1:50,000 topographic maps and B. C. Forest Service forest cover maps. For each location, data compiled included: elevation, aspect, slope, B.C. Forest Service timber type classification, and a landform classification.

Results and Discussion:

In total, five caribou were radio-collared: a subadult male in late July, 1978, but he either lost the collar or died within a month of capture;

a subadult female in mid-December, 1978; an adult female in late March, 1979; and an adult male and female in mid-April. Currently, these last four instrumented caribou appear in good health and the radio transmitters are still operable.

Our only appreciable radio tracking data has come from the female instrumented in mid-December. However, during flights and ground surveys we were able to record information on the distribution and habits of caribou (uncollared) in several other wintering areas within the study area. But until we are able to follow through with regular tracking of the present four instrumented caribou, only general features of seasonal movements and habitat selection can be discussed.

1. Late Spring - Fall

From late June to early October, 1978, all caribou or their sign were observed from subalpine forests above 1400 metres elevation, up to the alpine. They frequented high benches, rolling plateaus, subdued ridges, and upper creek valleys and basins. The major habitat types were mature Spruce-Balsam forests, often interspersed with meadows, bogs and small lakes, and adjacent subalpine parkland and alpine meadows.

Occasionally caribou sign was observed in high elevation seral vegetated areas, such as slides and recent clearcuts. Mountain caribou are apparently generalists in their summer food habits (Bloomfield, 1979) and likely feed in such forage abundant areas.

During July and August, and correlated to high temperatures and/or fly harassment, caribou were often observed resting on persisting snow patches in the alpine zone.

2. Late Fall - Early Spring

In October, and coinciding with the first major persisting snowfalls at high elevations, caribou shifted downslope, and in some cases apparently moved between drainages. The extent of fall movements appeared to vary locally within the study area. However, two general types of behaviour were apparent, seemingly dependent upon whether or not logging was conducted in high elevation arboreal lichen ranges.

i) In areas of no active high elevation logging, caribou exhibited the general pattern of movement and habitat selection described by Edwards and Ritcey (1959) and Bloomfield (1979).

By late October caribou were observed on lower slopes and valley bottoms at elevations as low as 760 metres (2500 feet). Until December, it appeared that they oscillated between low relief plateaus and benches, and valley bottoms, selecting mature Cedar-Hemlock and lower Spruce-Balsam forest types. Food selection included leaves of understory shrubs, various herbs, blow-down arboreal lichens, and probably grasses and sedges. Compared to mature subalpine forest and parkland areas, available arboreal lichen forage was sparse in these low elevation forests.

Through January, as snow support improved but understory forage became increasingly inaccessible at lower elevations, caribou were trekking back up to undisturbed Spruce-Balsam forests in subalpine and timberline areas. The settled, deep snows of late winter provided greater mobility for caribou and thus access to high elevation arboreal lichen ranges, as well as greater reach into trees laden with lichens. Caribou generally remained at high elvations until late April - early May, apparently as long as the snow cover provided support. Exceptions were occasional, but temporary shifts back down to mid-slope timbered areas during heavy snowfalls, particularly in January and February.

By early May (by this time we had four caribou radio-collared) caribou began to shift downslope, with most found on lower slopes and valley bottom Cedar-Hemlock. This movement coincided with deteriorating snow conditions at high elevations, and emerging spring vegetation at lower elevations. Seral vegetation in logged-off areas may have been utilized, however our tracking located all instrumented caribou in mature timbered areas.

ii) Active winter logging in high elevation Spruce-Balsam stands (1500-1800 metres) attracted carbiou bands to graze the extraordinarily abundant supply of arboreal lichens on felled trees and slash. In some cases the persistence of caribou aggregations about these clearcuts lasted from late October, on the heels of the loggers, until March if logging continued until breakup - but usually only until the skidders pulled out the last trees.

Prior to the settled snows of mid and late winter, caribou minimized the impediment of accumulating light snow by moving on roads and skid trails, and by yarding in mature timber adjacent to cutblocks. As the snow cover matured and support improved, caribou more frequently ventured away from and rotated use between felled-tree-lichens and nearby arboreal lichen ranges in standing timber. But when logging operations pulled out, caribou entirely shifted into and foraged considerably further through arboreal lichen ranges in mature Spruce-Balsam stands (lower subalpine) and subalpine parkland areas in the vicinity; they reverted to the pattern followed by carbiou in areas of no active winter logging.

The opportunistic behaviour of some wintering caribou to exploit the convenient supply of arboreal lichens on felled Spruce-Balsam timber is only transitory - as logging continues there will be little of this critical winter forage left.

Summary:

Because of the wide-ranging behaviour and the mountainous terrain and climate inhabited by mountain caribou, they have been difficult animals to study and only general features of their seasonal ecology are known.

In response to evident and serious declines of North Thompson caribou, the British Columbia Fish and Wildlife Branch in the summer of 1978 initiated a radio-tracking study to investigate the requriements of this population. Our research priorities include: identifying specific seasonal habitats, and connecting migration routes particularly those of winter; and the influence of environmental factors, such as snow conditions and food availability upon movement and habitat selection patterns.

In the North Thompson River watershed caribou winter range, the most critical of seasonal habitats, appears to consist of two components: in early winter, lower elevation forested areas (primarily merchantable Cedar-Hemlock-Spruce stands); and in late winter, lichen-rich subalpine forest (merchantable Spruce-Alpine Fir stands), and subalpine parkland. The availability of arboreal lichen forage in subalpine timbered areas appears to be particularly important for the winter survival of mountain caribou.

Now with four caribou radio-collared, we have an opportunity to refine our knowledge of their biology and ecology.

T.D. Antifeau
Fish and Wildlife Branch, Kamloops

12/7/79

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6. Closing Remarks (Peter Walton, ELUC Secretariat)

- first, a few words of thanks: to the speakers, who gave of their time and energy in making presentations to the Workshop, and to all participants who also made a valuable contribution to the Workshop through their questions, comments and discussion

- secondly, I would like to encourage comment on the format of the Workshop and on its relative success. We in the E.L.U.C. Secretariat are always interested in improving the effectiveness of our procedures.

- thirdly, as noted at the commencement of the Workshop, a record of presentations and of the key points of discussion will be circulated to all speakers and participants in the near future
- the Workshop is now over

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